THE MIDDLE DEVONIAN RUGOSE CORALS OF QUEENSLAND, III. BURDEKIN DOWNS, FANNING R., AND REID GAP, NORTH QUEENSLAND.

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Plates V. to XI.

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Summary.—In this paper twenty-three species of Rugosa, fifteen of them new, are described from the limestones of the Charters Towers and Townsville districts, with some discussions on the genera and families to which they are assigned. The fauna is very closely comparable to those of the upper Honsel (*quadrigeminus*) and Büchel (Massenkalk or *Amphipora* Bänke) beds of the Paffrath Basin near Cologne, Germany, so that its age is Givetian—and more narrowly, that middle section of the Givetian covered by the *quadrigeminus* and Büchel beds.

Some of the material described in this paper is in the Collection of the Geological Survey of Queensland, having been collected by various officers of that Survey. But the greater part, collected by Dr. F. W. Whitehouse or myself, is in the Geology Department of the University of Queensland. Collections have been made from the limestones at three different areas:—Burdekin Downs station, Fanning R. station, and the Reid Gap on the northern railway to Townsville.

At Burdekin Downs the limestones are impure and brown weathering, with some thick bands interbedded in a succession of thin (4 to 6 inch) layers. They overlie a massive quartzite, and have generally low dips, but are sometimes faulted, and in some places a granite shows up from beneath the basal quartzite.

On the Fanning R. from 1½ to 2 miles above Fanning R. homestead (location in 1939), the limestone is about 400 ft. thick, striking NNW-SSE, and dipping with a low dip (about 10°) WSW; it is fairly pure, and is grey to brown in colour. The succession observed was as follows, from above downwards:—

Sandstones with white clays up to 18 inches thick.

Shelly limestones (brachiopods and cephalopods).

Main coral and *Amphipora* limestone, about 400 ft. thick.

a. *Endophyllum-Stringophyllum isactis* beds, with very large *Atrypa.*

b. Beds with slender branching polyzoan.

c. Rather massively bedded limestones, in hard bands 4 to 6 inches thick, without shale partings, and with slight development of nodules; with *Stringophyllum bipartitum, Mesophyllum collare, Calceola* and *Atrypa.*

d. Two brown layers, with spherical weathering.

e. *Favistella rhenana* limestones, with many large stromatoporoids and a few *Stringocephalus.*

f. Yellow-weathering shale with gastropods (*Polyamma*).
g. Nodular limestones with *Favistella rhenana* and many *Stringocephalus*.
h. Nodular limestones with small pentameroids and Disphyllids.
j. *Amphipora ramosa* beds with small corals.

Intrusive granite.

Grey shales with limey concretions, and local transitions to nodular limestones with corals and stromatoporoids.

Limestones occur at various other localities on Fanning R. station, the distribution of the outcrops suggesting that they have been determined by faulting.

In the Reid Gap, on the northern Railway about 30 miles south of Townsville, there is another series of outcrops of this limestone, which appear to have been determined by faulting. The limestones here are grey to black, and are considerably metamorphosed, probably by contact metamorphism, as numerous porphyry dykes occur associated with them. They are rather more massive than on the Fanning R., and are of a very high degree of purity.

The lists of Rugose corals obtained from the various localities are as follows:—

Burdekin Downs.

(A) Burdekin Downs, hill rising from fowlyard. D. Hill Coll. 1939 *Acanthophyllum sweeti* rare; *?Dohmophyllum ?clarkei* very rare; *"Cystiphyllum" australe* very common; *Disphyllum* (or *Macgeea*) *trochoides* very common; *Stringophyllum isactis?* rare.

(B) On the north side of the Burdekin R., within ¾ mile of Burdekin Downs homestead. J. H. Reid Coll. 1917. *Dohmophyllum clarkei?, "Cystiphyllum" australe, Disphyllum trochoides, D. excavatum, Favistella rhenana.*

(C) Arthur's Ck. R. L. Jack Coll. *Spongophyllum immersum.*

(D) Fence running North from the East end of the night paddock. D. Hill Coll. 1939. *Dohmophyllum clarkei* fairly common: *"Cystiphyllum" australe* common; *Disphyllum trochoides* common; *Stringophyllum irregulare* common.

(E) Anabranch of Burdekin R. near Big Rocks. D. Hill Coll. 1939. *Acanthophyllum sweeti* common; *Dohmophyllum clarkei* fairly common; *Yabeia salmoni* rare; *Calceola sandalina alta* fairly common; *"Cystiphyllum" australe* fairly common; *Disphyllum gregorii* fairly common; *Fasciphyllum ryani* rare; *Stringophyllum quasinormale* rare; *S. quasinormale* var. *ana* common.

(F) Limestone dam. D. Hill Coll. 1939. *Acanthophyllum sweeti* rare; *Dohmophyllum clarkei* common; *Lyrielasma? lophophylloides* fairly common; *Yabeia salmoni* rare; *Calceola sandalina sandalina* common; *Calceola sandalina alta* fairly common; *"Cystiphyllum" australe* very common; *Stringophyllum quasinormale* very common; *S. quasinormale* var.? rare; *Stringophyllum irregulare* rare.

Fanning R.

A.—Main coral and *Amphipora* limestone, Fanning R. from about 1½-2 miles above Fanning R. homestead. D. Hill Coll. 1939. See p. 229.

Bed A: Top of Fanning R. limestone. *Dohmophyllum clarkei* rare; *Calceola sandalina sandalina* operculum, non in situ; *Endophyllum abditum* var. *columna* common; *Stringophyllum bipartitum* rare; *S. isactis* common.

Bed C: *Dohmophyllum clarkei* common; *Calceola s. alta*; *"Cystiphyllum" australe* rare; *Mesophyllum collare* rare; *Stringophyllum bipartitum* common.

Beds E-G: *Acanthophyllum sweeti* rare; *Dohmophyllum clarkei* common; *"Cystiphyllum" australe* rare; *Disphyllum ?gregorii* rare; *D.* sp. (thick-walled) rare; *Favistella rhenana* common; *Grypophyllum* sp. rare; *Spongophyllum bipartitum?* rare.

Beds H-J: Base of Fanning R. limestone. *Dohmophyllum clarkei* common; *Lyrielasma curvatum* common; *"Cystiphyllum" australe* rare; *Disphyllum gregorii* common; *Disphyllum trochoides?* (with stereozone) fairly common; *Grypophyllum* sp. rare; *Stringophyllum quasinormale* rare; *Stringophyllum irregulare* rare.

B.—Fanning R. limestone, on road on left bank of Fanning R., about 1½ miles upstream from Fanning R. homestead. F. W. Whitehouse Coll. 1938. *Dohmophyllum clarkei* common; *"Cystiphyllum" australe* rare; *Favistella rhenana* common; *Grypophyllum* sp. *Stringophyllum bipartitum* common; *Calceola sandalina alta,* fairly common.

C.—Windmill, about 3 miles ESE of Fanning R. homestead. D. Hill Coll. 1939. *"Cystiphyllum" australe* common, *Disphyllum trochoides* common; this locality is probably on an identical horizon with the hill rising from Burdekin Downs fowlyard.

D.—Dome in Fanning R. near Cow paddock tank, Fanning R. station. D. Hill Coll. 1939. *?Dohmophyllum; Calceola sandalina sandalina; "Cystiphyllum" australe; "C." pseudoseptatum; Mesophyllum* (*Dialithophyllum*) *fultum; Disphyllum ?.*

E.—Bauhinia limestone, on Mt. Success road 2½ miles from Fanning R. homestead. D. Hill Coll. 1939. *Dohmophyllum clarkei; "Cystiphyllum" australe; Stringophyllum bipartitum.*

F.—On Mingela road, 2½ miles from Fanning R. homestead. F. W. Whitehouse Coll. 1938. This is probably the same limestone outcrop as E. but the collection appears to have been made from a slightly different horizon, possibly lower. *Acanthophyllum sweeti; "Cystiphyllum" australe; Disphyllum gregorii; D. trochoides; Stringophyllum irregulare; Calceola sandalina alta.*

G.—Summit of hill about 2 miles North of Fanning R. homestead. F. W. Whitehouse Coll. 1938. *Dohmophyllum? clarkei; ?Dohmophyllum* sp. *"Cystiphyllum" australe; ?Disphyllum ?gregorii; D.* sp. (thick walls) *Favistella rhenana; Stringophyllum ?irregulare.*

Reid Gap, on northern railway, 31 miles south of Townsville.

A.—Regan's Quarry (thought to have been in portion 397v parish of Magenta). E. Edelfelt Coll., probably about 1883. *Acanthophyllum sweeti, Dohmophyllum ?clarkei, "Cystiphyllum" australe; Disphyllum gregorii; D. trochoides.*

B.—Benwell's En. Selection. E. Edelfelt Coll. *"Cystiphyllum" australe; Disphyllum gregorii; D. trochoides.*

C.—Philp's. E. Edelfelt Coll. 1883. *Disphyllum gregorii.*

D. Ryan's Quarry, Calcium (portion 62v, parish of Wyoming). C. C. Morton Coll. *Favistella rhenana, Fasciphyllum ryani, Stringophyllum bipartitum.*

E.—Portion 370 parish of Magenta, lower bed. F. W. Whitehouse Coll. 1936. *Acanthophyllum sweeti; Dohmophyllum clarkei; "Cystiphyllum" australe* near *pseudoseptatum; Disphyllum ?gregorii; D. trochoides; Fasciphyllum ryani; Stringophyllum quasinormale; S. irregulare.*

30 ft. above lower bed. *Disphyllum excavatum.*

F.—Portion 54 parish of Wyoming. F. W. Whitehouse Coll. 1936. *Acanthophyllum sweeti; Dohmophyllum clarkei; "Cystiphyllum" australe; Disphyllum gregorii; D. trochoides?; Stringophyllum quasinormale.*

G.—Portion 81v, parish of Wyoming. Lower part of limestone. F. W. Whitehouse Coll. 1936. *Dohmophyllum clarkei; "Cystiphyllum" australe; Disphyllum* sp.; *Grypophyllum compactum: Stringophyllum irregulare.*

A study of the above lists show that their faunas are fairly uniform, although two species occur in only one locality, i.e., at the top of the limestone on the Fanning R. The following general list of the entire fauna shows the foreign species to which ours are most closely comparable.

Family Acanthophyllidae.

Acanthophyllum sweeti (Eth.) cf. *"Stenophyllum" diluvianum* Amans. from the Niederehe (Eifel) upper coralline limestone, and the *reticularis* marl at the base of *Stringocephalus* beds of Soetenich in the Eifel.

Dohmophyllum clarkei sp. nov. cf. *Sparganophyllum difficile, S. simplex, S. gracile* Wdkd. from the *quadrigeminus* beds of Hand, in the Paffrath Basin.

Lyrielasma curvatum sp. nov.

L. ? lophophylloides sp. nov. cf. *Cyathophyllum hallioides* Frech, crinoid beds, Dalbenden near Urft in the Eifel.

Ampleximorphs.

Yabeia salmoni sp. nov. cf. *Yabeia* from the Devonian of Yunnan, China.

Family Calceolidae.

Calceola sandalina sandalina Linn. from the *S. ostiolatus* beds (*Calceola* beds) of the Eifel, and lower part of *Stringocephalus* beds of Sauerland.

C. sandalina alta Richter from the *D. verneuili* beds of the Eifel, and middle part of *Stringocephalus* beds of Sauerland.

Cystimorphs.

"Cystiphyllum" australe (Eth.) cf. *Microplasma schlüteri* Wdkd. from the Upper Honsel beds of Emst, near Hagen, Germany; *Cystiphylloides* Yoh, lower Givetian of Kwangsi, China; *"Cystiphyllum" americanum* Ed. & H. *partim* from the Hamilton of New York.

"C" cf. *pseudoseptatum* Schulz from the upper coralline limestone of Niederehe in the Eifel.

Family Digonophyllidae.

Mesophyllum collare sp. nov. cf. (not very close to) some *Atelophyllum* Wdkd. from the upper Honsel beds of Emst, near Hagen, Germany.

M. (*Dialithophyllum*) *fultum* sp. nov. cf. *D. complicatum* Wdkd., topmost Honsel beds, Genna, Germany.

Family Disphyllidae.

Disphyllum gregorii (Eth.) cf. *C. caespitosum* var. *breviseptata* Fr. (?Plattenkalk), Refrath near Cologne, Germany; *D. emsti* (Wdkd.), Upper Givetian of Moravia.

D. (or *Macgeea*) *trochoides* sp. nov. cf. *D.* (or *M.*) *spongiosum* (Schl.), Büchel beds of Paffrath Basin; *D.* (or *M.*) *conicum* (Kett.), upper Givetian of Moravia.

D. (or *M.*) *excavatum* sp. nov. cf. *C. bathycalyx* Frech, 1886, pl. v, fig. 24 only, crinoid beds, Muhlberg in the Eifel.

Family Endophyllidae.

Endophyllum abditum E. & H. var. *columna* var. nov. cf. *E. colligatum* Eth., Middle Devonian of Tamworth, N.S.W.

Family Favistellidae.

Favistella rhenana Frech from the *quadrigeminus* and Büchel beds near Hand in the Paffrath Basin, Germany.

Fasciphyllum ryani sp. nov.

Family Spongophyllidae.

Spongophyllum immersum sp. nov. cf. *S. kunthi* Schl. and *S. parvistella* Schl., lower *Stringocephalus* beds of the Eifel.

Grypophyllum sp. cf. *G. normale* Wdkd., *quadrigeminus* beds of Hand, in the Paffrath Basin, Germany.

Grypophyllum compactum sp. nov. cf. *G. tenue* Wdkd., *quadrigeminus* beds of Hand, in the Paffrath Basin.

Stringophyllum quasinormale sp. nov. cf. *S. normale* Wdkd., *quadrigeminus* beds of Hand, in the Paffrath Basin; *Bornhardtina* beds of Soetenich in the Eifel.

S. quasinormale var. ?

S. quasinormale var. *ana* nov.

S. bipartitum sp. nov. cf. *S. büchelense* (Schl.), Genna, Germany [? upper Honsel].

S. irregulare sp. nov. cf. *S. tenue* Wdkd., Schwelm, Germany [? Massenkalk].

S. isactis (Frech) from the Büchel beds of Schladetal and Büchel in the Paffrath Basin; upper Givetian of Moravia.

The relationships may be summarised as follows:—

	Paffrath Basin.	Id.*	Comp.*	Altena Saddle.	Id.	Comp.	Eifel.	Id.	Comp.
Upper Middle Devonian = *Stringocephalus* beds = Givetian.	Plattenkalk		1						
	Massenkalk = Büchel	2	1			1			
	Up. Honsel = *quadrig.*	1	4	Upper Honsel		4	Up. Coral 1st Crinoid beds		3 2

* Id. = Identical, Comp. = comparable species.

Thus there is a striking similarity to the fauna of the *quadrigeminus* beds of the Paffrath Basin near Cologne in Germany, and their German equivalents, and I consider that the bulk of the North Queensland limestones are roughly equivalent to the *quadrigeminus* beds of the Paffrath Basin. But on the Fanning R. at least, the top of the limestone probably equals some part of the succeeding Büchel beds (Massenkalk) of the Paffrath Basin, for it contains a species characteristic of the Büchel beds. The list also indicates a relation to the Chinese province. Only one species is comparable with the American Hamilton fauna. The study thus shows that the Burdekin, Fanning and Reid limestones are younger than the Murrumbidgee limestones of New South Wales, and the Clermont and Silverwood limestones of Queensland, all of which are considered to be Couvinian (Hill, 1939b, 1940a, 1940c).

SYSTEMATIC DESCRIPTIONS.

The descriptions given below are based on 524 thin sections and more than 1,000 specimens. It is noticeable that the individuals of many species, particularly those of the genera *Acanthophyllum, "Cystiphyllum," Disphyllum* and *Stringophyllum* could be divided into local races, from the morphological characters shown by them at the different localities. These races are not herein regarded as varieties, but are mentioned or described in the remarks on the species.

All genera described or named herein are interpreted on the genotypes given in Lang, Smith and Thomas, 1940, which should be consulted for references to the works in which the genera and their genotypes were founded.

FAMILY ACANTHOPHYLLIDAE.

Acanthophyllidae; Hill, 1939a, p. 220; 1939b, p. 56; Hill and Jones, 1940, p. 178.

Genus *Acanthophyllum* Dybowski.

Acanthophyllum Dybowski; Hill, 1939a, p. 222; 1939b, p. 56; Hill and Jones, 1940, p. 179.

Remarks: The genus as diagnosed in the references given above has wide limits, and as our knowledge of Devonian Rugosa becomes more soundly based, it may be found reasonable to split it. Thus there appears to be a distinctive morphological sub-group in the Givetian of Germany and Queensland, embracing the two species *Cyathophyllum sweeti* Etheridge and *Stenophyllum diluvianum* Amanshauser MS in Wedekind (1925, pp. 9, 12, text-figs. 3-4). These differ only in size and number of septa; the German species is about 28 mm. in diameter, with 34 septa of each order; but the Queensland species is smaller, up to 14 mm., with at most 28 septa of each order. In both, the septa are rather broadly waved in the dissepimentarium, and frequently show cymatoid carinae in the tabularium; the major septa are unequal and extend almost to the axis, without vortical curvature in the tabularium; dilatation of the septa occurs only near the epitheca. The calice is concave like an inverse cone, and the tabulae are very close. This sub-group is at present without a separate generic name, for although *S. diluvianum* is the genotype of *Stenophyllum,* this name is pre-occupied (see Lang, Smith and Thomas, 1940, p. 123). In this paper the sub-group is placed in *Acanthophyllum.* The cymatoid carinae of the septa and the arrangement of the axial ends of the major septa in the sub-group, where the cardinal or counter septum may frequently be longer than the others, are seen also in other genera regarded as

members of the Acanthophyllidae—the Silurian *Cymatelasma* and *Spongophylloides,* and the Devonian *Lyrielasma*; and in other species of the genus *Acanthophyllum—A. elongatum* and *A. dianthus* (Goldfuss), both described as Cyathophyllids by Le Maitre, 1934, from beds transitional between the Coblenzian and the Couvinian.

Acanthophyllum sweeti (Etheridge) Pl. V., figs. 1-5.

Cyathophyllum sp. ind. Etheridge, 1892, p. 59, pl. 3, figs. 11, 12; Regan's Quarry, Reid Gap.

Cyathophyllum sweeti Etheridge, 1895, p. 521, pl. xl., figs. 3, 4; pl. xli., fig. 1, Reid Gap.

Lectotype: on F 1652, Geological Survey of Queensland, from Regan's Quarry, Reid Gap, figd. Etheridge, 1892, *loc. cit.* Givetian.

Diagnosis: Acanthophyllum with about 26 septa of each order rather broadly wavy in the dissepimentarium, and somewhat dilated towards the periphery; the major septa are unequal and not vortically rotated, and may have cymatoid carinae in the tabularium; the cardinal or counter septum is frequently longer than the others.

Description: The corallum is trocho-cylindrical and probably solitary, and frequently somewhat vermiform. It may attain a diameter of 14 mm., in a height of 45 mm., but most corallites are fragmentary and rather slenderer. The epitheca shows narrow longitudinal septal furrows, and broad intervening ribs, all crossed by fine growth striation, and occasional growth constrictions. The calice is deeply oval like an inverse cone. The corallum is often somewhat oval in transverse section.

In the figured section of the lectotype, taken through the base of the calice, there are 26 septa of each order, but in most specimens the number is somewhat smaller. The septa dilate slightly in the outer parts of the dissepimentarium, gradually increasing till nearly at the epitheca, and then suddenly forming a narrow crenulate stereozone; the dilatation may spread over the upper surfaces of the outermost dissepiments. The minor septa are less dilated than the major septa. The septa are broadly and irregularly wavy, particularly near the epitheca. The major septa are unequal and usually fail to reach the axis, but in some corallites one may extend right to the axis; in one specimen at least this long septum is the counter septum, for its neighbouring minor septa are longer than the others. The major septa may have cymatoid carinae in the tabularium. The minor septa extend up to two-thirds of the way to the axis. The dissepiments are highly inclined and rather elongate, and the outermost series may be dilated. The tabular floors are thin and close, and concave, sometimes deeply so, or with a median notch, and are formed of numerous elongate tabellae.

Localities: Burdekin Downs, A,[1] E, F; Fanning R., A,F; Reid Gap, A (type locality), E,F.

Remarks: This species is almost identical with *A. diluvianum* (see p. 234) from the upper coralline limestone (*Cosmophyllum* beds) of Niederehe in the Eifel, which are at the top of the middle Middle Devonian of Schulz, i.e. near the top of the lower Givetian. Schmidt (1936, p. 317) has recorded *A. diluvianum* from the *reticularis*-marl at the base of the upper Middle Devonian of Soetenich in the Eifel. The only difference is that the Queensland species is smaller and has fewer septa than the German. The specimens from the type locality

[1] For explanation of localities referred to by letters see pp. 230-232.

are frequently slenderer than the type, while those from Burdekin Downs A (on the hill rising from the fowlyard) are somewhat stouter. Specimens from the anabranch of the Burdekin R. near Big Rocks (Burdekin Downs E) are on the whole much slenderer than those from the type locality, though some are stout, and many have recessive minor septa; this last character is so striking that it might prove better to regard the individuals showing it as a variety, but this is not done herein. Other specimens from this locality show a particularly strong development of cymatoid carinae. Specimens from Reid Gap E (portion 370 parish of Magenta) are very similar to those from the type locality.

Genus *Dohmophyllum* Wedekind.

Dohmophyllum Wedekind, 1923, pp. 29, 30; 1924, p. 76.

Trematophyllum Wedekind, 1923, pp. 27, 35 (genus caelebs); 1924, pp. 72, 75; genolectotype, chosen Lang, Smith and Thomas (1940, p. 135) *T. schulzi* Wedekind, 1924, p. 76, text-fig. 104, Lower Middle Devonian (lower coralline limestone), Niederehe, the Eifel.

Sparganophyllum Wedekind, 1925, p. 13; genoholotype *S. difficile* Borchers MS in Wedekind, 1925, pp. 13, 14, text-fig. 9; *quadrigeminus* beds of Hand near Bergisch Gladbach; and Pillingserbachtal, near Letmathe, Germany.

Genoholotype: D. involutum Wedekind, 1923, text-fig. 7 on p. 30; 1924, text-fig. 108. Crinoid beds (base of *Stringocephalus* beds), Auburg, near Gerolstein in the Eifel.

Diagnosis: Large, simple Rugose corals with a wide dissepimentarium of fine dissepiments, with numerous close, flattened tabellae arranged in irregular floors without a median notch, with long unequal major septa, sometimes slightly carinate, and with a vortical axial structure or an axial column of discrete, thickened, curved septal ends, often carinate.

Remarks: In my opinion the genera given in the synonymy should be merged, the distinctions made by Wedekind, on shape of calice, type of septal carination, and tightness of axial structure being considered of not more than specific value in this group. Together they characterise a relatively short period of time, from the top of the *Calceola* beds to the top of the lower part of the *Stringocephalus* beds of the German succession, and they are all covered by the diagnosis given above. The best known member of the genus is perhaps *D. helianthoides* (Goldfuss) from the crinoid beds of the Eifel. In its long, unequal septa and its close flattened tabellae the genus shows the characters of the Acanthophyllidae; but these tabellae are arranged in irregular groups, many of which appear to indicate irregularly domed tabular floors; and by this character they are separable from *Acanthophyllum,* which typically has regularly concave floors with a median notch. *Stenophyllum implicatum* Wedekind (1925, text-fig. 7) from the coralline crinoidal limestone (*Cosmophyllum* beds) of Dachsberg in the Eifel, appears to belong to the genus. Our Queensland species is closest to the German forms from the *quadrigeminus* beds of Hand in the Paffrath Basin.

Dohmophyllum clarkei sp. nov. Pl. V., figs. 6-11.

Holotype: F. 4531, University of Queensland Collection, base of Fanning R. limestone, about 2 miles upstream from Fanning R. homestead (1939). Givetian.

Diagnosis: Large trochoid or trocho-cylindrical *Dohmophyllum*, frequently with rejuvenescence; the axial ends of the long major septa are usually twisted in a moderately wide vortical axial structure; the minor septa are long and both orders are thin except at the periphery, where they suddenly dilate wedge-wise into a fairly narrow stereozone.

Description: The corallum is large and solitary, though usually associated with others of the same species; it is trochoid at first, tending to become cylindrical later; rejuvenescence may frequently cause a sudden decrease in diameter. It is often somewhat flattened. The holotype has a longer diameter of 28 mm. and a shorter diameter of 24 mm. at about 35 mm. from the apex, and is almost erect. Some coralla may be smaller, others much larger; one is 150 mm. long, with a longer diameter of 60 mm.; some may show slight curvature.

The average number of septa of each order is 28 or 30, but small corallites may show fewer, and large corallites up to 37 of each order (at a diameter of 46 mm.). The septa are thin, and usually without carinae, though some short, ragged trabecular carinae may occur on them near the inner margin of the dissepimentarium or in the tabularium. They expand suddenly wedgewise at the periphery, to form a stereozone; this is almost 1 mm. wide in the holotype; it tends to be widest near the apex, and thinnest near the calice. The septa are often somewhat wavy just inside the stereozone, and they may sometimes be discontinuous there. The major septa extend unequally towards the axis; typically many of them are strongly rotated in a counter-clockwise direction in the tabularium, thus forming a vortical axial structure, but they may be almost straight therein; sometimes they are somewhat withdrawn from the axis. The interseptal loculi in the tabularium are somewhat unequal. The septal ends may be somewhat thickened in the tabularium. In one specimen (F 4471) some of the septa are broken off from their axial ends which are twisted together irregularly, forming an axial column as in some *D. helianthoides* (Goldfuss). The minor septa extend nearly two-thirds of the way to the axis in the adult stages, rather less in younger stages, and more in very well developed coralla. The dissepiments are numerous and rather globose, but less so than in other species of the genus, and are steeply inclined. They are frequently geniculate in transverse section of the corallum. The tabular floors are usually irregular, sometimes sagging on one side and domed on the other. They are formed by numerous rather flattened tabellae, though occasional arched plates are seen, and are almost as closely spaced as the successive dissepimental floors. The width of the tabularium is variable, up to one-third the diameter of the corallum. The horizontal skeletal elements are consistently thinner than the septa.

Localities: Burdekin Downs A?, B?, D, E, F; Fanning R. A. (including type locality), B, D?, E, G?; Reid Gap A?, E, F, G.

Remarks: The queries in the locality list refer to specimens, from the locality cited, only doubtfully referred to *D. clarkei*. The species is close to individuals from the *quadrigeminus* beds of Hand in the Paffrath Basin, figured by Wedekind (1925) as *Sparganophyllum difficile, S. simplex,* and *S. gracile*; these have a similar number of septa and a similar external form, but the limits of variation in the German species are unknown. Our species varies within wide limits, and the chief variables are:—size of corallum, the number of septa taking part in the axial structure, the degree of the rotation of the axial ends and the degree to which these are discrete, and the width of the tabularium.

The dilatation and waviness of the septa vary slightly. The variation was not found to be of any strict significance geographically or stratigraphically.

Genus *Lyrielasma* Hill.

Lyrielasma Hill, 1939a, p. 243.

Genotype: Cyathophyllum subcaespitosum Chapman, 1925, p. 112, pl. xiii., figs. 15, 16a, b. Devonian, Cave Hill, Lilydale, Victoria.

Diagnosis: Fasciculate Rugosa with the major septa directed towards the median plane, with wide, deeply concave incomplete tabulae, and with a peripheral stereozone of irregular width, formed by the dilatation of major and minor septa in the dissepimentarium.

Range: Lower or Middle Devonian of Victoria.

Lyrielasma curvatum sp. nov. Pl. V., figs. 12-14.

Holotype: F 4423, University of Queensland Collection, base of Fanning R. limestone, Fanning R. about 2 miles above Fanning R. homestead. Givetian.

Diagnosis: Lyrielasma in which the axial ends of the septa may be vortically curved, and the tabulae may be horizontal or even slightly domed.

Description: The corallum is probably phaceloid, one section and some specimens showing corallites in such positions in the matrix as to suggest that smaller corallites arise from larger by lateral increase. The average diameter is 15 mm., and the corallites are cylindrical or slenderly trochoid, and may be erect or curved. Neither calice nor epitheca could be studied. There are about 25 septa of each order, dilated towards the periphery, so that a stereozone of irregular width is formed, varying from one corallite to another from 1 mm. to 4 mm. The major septa reach or almost reach the axis; they are unequal; sometimes they are arranged not very regularly about a median plane, but more often their axial ends are vortically curved. The dissepiments are small and steeply inclined, and are often geniculate in transverse section. The tabular floors are flat or gently domed or saucered, and are formed of numerous, close lying, flat tabellae.

Remarks: The species is placed somewhat doubtfully in *Lyrielasma* because its flat lying tabellae and the vortical curvature of its axial septal ends, which are not very distinctly arranged about a median plane, have not previously been observed in the genus. No foreign species is known to resemble it at all closely.

Lyrielasma(?) *lophophylloides* sp. nov. Pl. VI., figs. 1, 2.

Holotype: F 5129, University of Queensland Collection, Burdekin Downs, limestone dam. Givetian.

Diagnosis: Phaceloid Rugosa whose slender corallites have straight septa, with one longer and thicker than the others, highly inclined dissepiments and deeply concave tabulae.

Description: The corallum is phaceloid, with cylindrical corallites; increase is lateral. The corallites are about 9 mm. in diameter, and the nature of their epitheca and calice are not known. There is a narrow peripheral stereozone about 0·5 mm. wide, formed by lateral dilatation of the septal bases. There are 20 major septa extending unequally to the axis, all straight throughout their length; one, possibly

the counter or the cardinal septum, is longer than the others, and slightly thicker. One septum opposite to this, and two almost at right angles to it, may be but little shorter than it, and a little longer and thicker than the remaining septa. The 20 minor septa extend about two-thirds of the way to the axis. The dissepiments are equal and highly inclined. The tabularium is narrow and contains inversely conical, complete tabulae, rather distantly placed.

Remarks: It is doubtful that this species is of the genus *Lyrielasma*; it is provisionally placed therein because in the genotype the cardinal or counter septum is occasionally longer than the others, and the tabulae are inversely conical, and these are characters possessed by the new species. In internal structure it resembles very closely *Cyathophyllum hallioides* Frech (1886, p. 177, pl. xix., figs. 6, 6a, 15) from the crinoid beds of Dalbenden near Urft in the Eifel (that is, at the base of the lower part of the *Stringocephalus* beds of Germany); but the German species is solitary and has a wider dissepimentarium.

AMPLEXIMORPHS.

Ampleximorphs; Hill, 1940b, p. 390.

Solitary or fasciculate Rugose corals which have thin walls, short lamellar septa and complete tabulae, and are without dissepiments.

Genus *Yabeia*[1] Lang, Smith and Thomas.

Yabeia Lang, Smith and Thomas, 1940, p. 141, *nom. nov.* for *Cylindrophyllum* Yabe and Hayasaka, 1915, p. 90. *Cylindrophyllum* was pre-occupied in 1900.

Genoholotype: Cylindrophyllum simplex Yabe and Hayasaka, 1915, p. 90, and 1920, p. 133, pl. vi, figs. 3a-b; Devonian, neighbourhood of Hung-kuo-chi, Ta-kuan-ting, Chao-tung-fu, Province of Yun-nan, China.

Diagnosis: "Corallum composite, fasciculate; corallites long, erect, subparallel, only in contact at the point of gemmation; surface of the corallites transversely wrinkled and finely striated. No septa or septal spines at all. Tabulae complete, moderately close, horizontal. Multiplied by lateral gemmation."

Remarks: Owing to the complete absence of septa it must be questioned whether this genus is a Rugose coral, and it is placed rather doubtfully with the ampleximorphs.

Yabeia salmoni sp. nov. Pl. VI, figs. 3, 4.

Holotype: F 5025 University of Queensland Collection, Burdekin Downs station, on the anabranch of the Burdekin R. near Big Rocks. Givetian.

Diagnosis: Yabeia with distant tabulae.

Description: The specimens consist of numerous parallel or almost parallel cylindrical corallites, from 5 to 10 mm. in diameter, often crushed. Their manner of aggregation suggests that they are parts of a laterally increasing phaceloid corallum, but increase was not directly observed. The epitheca is transversely wrinkled and finely annulate, but no longitudinal striation can be distinguished. The wall is very thin, less than 0·25 mm. No septa or septal spines can be found. The tabulae are thin, horizontal and inequidistant, from 2 to 4 mm. apart. Walls and tabulae are usually lined with secondary calcite prisms.

[1]This name is pre-occupied by *Yabeia* Resser and Endo, 1935. See Neave's Nomenclator Zoologicus, Vol. IV., published in 1940.

Localities: In addition to the type locality, the species occurs on Burdekin Downs station at the limestone dam.

Remarks: Our form differs from the Chinese genotype in the greater distances between its tabulae. The absence of all traces of septa, either lamellar or spinose, is very striking; none are to be found even in tangential sections cutting obliquely into the lumen from the wall; nor are there any longitudinal striations on the epitheca such as usually correspond with septa. It thus differs from the German Givetian *Cyathopaedium,* for lamellar septa are well shown in Schluter's figures of his genotype. *Cyathopaedium* may be identical with the previously founded Silurian *Pycnostylus* Whiteaves (Hill, 1940b, p. 391). We have no information on the nature of the septa in another Devonian phaceloid ampleximorph, *Placophyllum* Simpson, from the Onondaga (Lower Middle Devonian) of North America.

FAMILY CALCEOLIDAE.

Family Calceolidae Lindstrom, 1883, p. 9, emended Hill, 1940b, p. 393.

Genus *Calceola* Lamarck.

Calceola Lamarck; Lindstrom, 1883; Richter, 1928, p. 174.

Genotype: Anomia Sandalinum Linnaeus, Germany.

Diagnosis: Calceoloid corals with semi-circular operculum; with the counter quadrants on the flattened side, and the cardinal on the curved side; the skeletal elements are so dilated that all interseptal loculi are filled up.

Remarks: Richter (1928) has concluded that the genus, which is characteristic of the Middle Devonian of Europe, Asia and Australia, but has not been recorded from America, contains one species only.

Calceola sandalina (Linnaeus).

Calceola sandalina (Linnaeus); Lindstrom, 1883, p. 10; Richter, 1928, p. 174.

Diagnosis: As for the genus.

Remarks: After statistical work on the variations in external form of German and other individuals, Richter (1928) has divided the species into four sub-species with range and characters as follows:—*Calceola sandalina* oldest mutation, occurs in the *cultrijugatus* beds at the base of the Couvinian in the Eifel, and in the lower Couvinian of Spain; the angle made by the edges of its flat side at the apex varies between 45° and 65°, but mostly between 55° and 62°. *Calceola sandalina sandalina* (see below). *Calceola sandalina alta* (see below). *Calceola sandalina westfalica* Lotze, occurs in the upper part of the Givetian of the German Sauerland, and at Muhlberg in the Eifel, in beds which were previously regarded as basal Givetian (Richter, 1928, p. 176); its angle varies between 50° and 75°, but mostly between 60° and 65°, and its sides are curved by a gradual broadening of the angle with growth.

Large, broad-angled and small, narrow-angled *Calceola* occur together in the North Queensland limestones, and appear to be referable on their external form to *C. sandalina sandalina* and *C. sandalina alta,* although my measurements of the average angle give in each case an increase of 5° to 10° on those given by Richter.

Calceola sandalina sandalina (Linnaeus) Pl. VI, figs. 5, 6.

Calceola sandalina sandalina (Linnaeus); Richter, 1928, p. 174.

Diagnosis: Large and broad *Calceola sandalina,* with apical angle between 50° and 80°, and usually between 60° and 70°.

Description of Queensland forms: The corallum is large, with a height of from 30 to 50 mm., and a breadth of from 50 to 60 mm. The apical angle varies from 70° to 90°, the average being about 80°. The flat (counter) surface is occasionally almost erect, but usually curves inwards during growth. The sides of the flat face are usually straight, so that the angle is constant throughout growth. The epitheca of the flat face shows a median ridge, and numerous ridges and furrows parallel to this. The calice is very deep, reaching almost to the apex. Vertical sections show that the sclerenchyme is deposited in successive growth lamellae.

Localities: Burdekin Downs F; Fanning R. D.

Remarks: The Queensland specimens agree with the descriptions of the German subspecies, except for the somewhat wider angle in our forms. In Germany the subspecies occurs in the *ostiolatus* (= *Calceola*) beds and in the lower part of the *Stringocephalus* beds.

Calceola sandalina alta Richter. Pl. VI, figs. 7-9.

Calceola sandalina alta Richter; Richter, 1928, p. 175.

Diagnosis: Small and narrow *Calceola sandalina,* with apical angle between 35° and 60°, and usually between 40° and 45°.

Description of the Queensland forms: The corallum is small, with a height of from 14 to 25 mm., and a breadth of from 10 to 21 mm. The apical angle varies between 35° and 60°, but most individuals are between 45° and 55°. The flat (counter) surface is often erect, but is more often slightly curved inwards. The sides of the flat face are usually quite straight. The calice is very deep, extending almost to the apex.

Localities: Burdekin Downs E, F; Fanning R. A, B, F.

Remarks: The Queensland specimens, like those of *C. sandalina sandalina* are preserved in bedded limestones, and do not weather out, so that it is difficult to measure their apical angle accurately. Our specimens appear to have a wider angle than the German. In Germany the subspecies occurs in the beds with *Dechenella verneuili* in the Eifel, and in the middle part of the *Stringocephalus* beds on the right side of the Rhine.

CYSTIMORPHS.

Cystimorphs; Hill, 1939a, p. 248.

Wedekind and Vollbrecht (1931) have considered that the cystimorphs of the lower part of the German *Stringocephalus* beds which are usually included in *Cystiphyllum pseudoseptatum* Schulz are of the same family as *Arcophyllum, Hemicystiphyllum* etc., and have described the family as the Lytophyllidae (i.e., Lithophyllidae). The character which they considered diagnostic of this family is the "septal cone." In *C. pseudoseptatum* and similar forms the septa are visible only as septal remnants in successive zones of skeletal dilatation; each zone of dilated tissue is deposited on one old calical floor, and thickens the dissepiments and tabulae at this position; the dilatation is greatest in the middle of the floor, and decreases towards the periphery; as the calical floor is conical in all these forms, the zone of dilatation is conical also. These successive zones of skeletal dilatation, as the present author

prefers to call them, rather than "septal cones," seem to her to represent successive zones of internal structural rejuvenescence, such as were suggested by Lang (1909, p. 290); while Ma (1937, p. 8) has considered that they represent the internal structural accommodation of the skeleton to annual seasonal changes. If they represent rejuvenescence, they would be very striking in forms whose young and old developmental stages are unlike, e.g., where the young stage has numerous thick septa, and the old stage no septa at all. In forms on the other hand where there is little difference between the septa of the young and the old stages, the difference would be least noticeable, and the zones of rejuvenescence might easily escape observation. These zones are important in *"C." pseudoseptatum,* but are much less important in *Mesophyllum,* though they do occur in this genus as in other Rugosa. They do not seem to be a satisfactory criterion for a family.

I have preferred to group the cystimorphs *Arcophyllum, Hemicosmophyllum* etc. as possible sub-genera of *Mesophyllum* (see below p. 245), and because these forms all have an elongate minor septum in the counter fossula, I have included them in the Digonophyllidae (see p. 244).

The remaining cystimorphs of the lower part of the German *Stringocephalus* beds including *"C." pseudoseptatum* have been considered by early authors under *Cystiphyllum* and *Microplasma,* while lately Wedekind, and Wedekind and Vollbrecht have used *Microplasma, Lithophyllum, Paralithophyllum, Nardophyllum* and *Plagiophyllum. Cystiphyllum* was founded for Silurian cystimorphs, which have discrete trabeculae preserved as holacanths, and holacanths have not been observed in any Givetian cystimorphs. *Microplasma* has for genotype a Silurian fasciculate cystimorph from Gotland, whose internal structure is insufficiently known for exact taxonomy in such a difficult group as the cystimorphs. *Lithophyllum* and *Nardophyllum* (= *Plagiophyllum*) have for genotypes forms in which the tabularium is not central, but is near or at the wall. Wedekind and Vollbrecht have shown that the position of the tabularium, while usually almost central, is variable in the group about *C. pseudoseptatum,* and it may be that it is not of generic value in the cystimorphs. The genotype of *Paralithophyllum* has not been figured.

Thus there is at present no satisfactory solution of the taxonomic problem of those Devonian cystimorphs which never show traces of the long counter minor septum of the Digonophyllidae. Such a solution must be based on a re-study of the German forms, since the great majority of the generic names have been applied to these; but this is not possible at present, and in this paper *"Cystiphyllum"* is used. Some, indeed, may have been derived from the Digonophyllidae, and for such the name *Cystiphylloides* Yoh (1937, p. 53) is available; but at present we have no certain means of distinguishing them.

The position of the cystimorphs of the lower *Calceola* beds of the Eifel, divided by Wedekind (1924) among *Zonophyllum, Legnophyllum* and *Pseudophyllum* must remain in doubt until their characters can be more clearly established. From the figures alone it appears that they could belong to the Digonophyllidae or to the cystimorphs like *"C." pseudoseptatum.*

"Cystiphyllum" australe Etheridge (Pl. VI, figs. 10-13.)

Cystiphyllum americanum Edw. and Haime, var. *australe* Etheridge, 1892, p. 58, pl. iii, figs. 13, 14.

Lectotype (here chosen) on F 1652, Geological Survey of Queensland Collection, Regan's Quarry, Reid Gap; Givetian.

Diagnosis: Cylindrical cystimorphs typically without successive zones of skeletal dilatation, and with traces of trabeculae typically confined to a very narrow peripheral stereozone.

Description of the lectotype: The corallum is cylindrical and curved, with a maximum diameter of 28 mm.; the lectotype is 110 mm. long and incomplete, and in its distal parts shows rejuvenescence by which the diameter is reduced; this rejuvenescence breaks the epitheca at only one position, that of the thin section figured, and is not associated with skeletal dilatation. There is a peripheral stereozone about 1 mm. wide, in which short trabeculae may be counted indicating between 80 and 100 septa, presumably including both minor and major. The trabeculae may extend about 0·5 mm. into the lumen, and may be repeated on the first series of dissepiments, but none are seen inside this. The tabularium occupies almost one half of the lumen, and its plates are much larger than those of the dissepimentarium; they are arranged in concave tabular floors, and those which are the more inclined (the outer) are inflated in their upper parts. The tabularium is not quite central in the thin section figured. The plates of the dissepimentarium are smaller, more steeply inclined and less globose than those of the tabularium; they are not dilated; rarely they are inflated in their upper parts. Apart from the peripheral stereozone, there are no zones of skeletal dilatation.

Localities: Burdekin Downs A, B, D, E, F; Fanning R. A, B, C, D, E, F, G; Reid Gap A (the type locality), B, E, F, G.

Remarks: This is the commonest species in the north Queensland Givetian limestones. The tabularium is nearly always almost central. There is considerable variation from locality to locality, particularly in size. At the type locality, only a few specimens have a diameter greater than 28 mm., others are smaller. Those collected from the nearby portion 54 Wyoming (Reid Gap F) in large numbers have an average diameter of 16 mm. only, but in internal structure they are indistinguishable from the lectotype. They are mostly somewhat worn, and some thus show the long thickened bases of the septa; those weathered a little more may show long rows of dots representing the inner ends of the trabeculae. They show little curvature. One has a talon, probably indicating that the species is haploid (solitary). Specimens from Burdekin Downs, on the hill behind the fowlyard (A), are very close to the lectotype, but some show zones of skeletal dilatation, which may be very slightly or moderately developed. Others have rather larger dissepiments which are also more inflated in their upper parts. Specimens from the fence running N from the E end of the night paddock (Burdekin Downs D) are practically identical with the lectotype, though larger and smaller coralla occur. Some from the limestone dam on Burdekin Downs (F), where the size is usually greater, show larger dissepiments than the lectotype, which are also more swollen distally, so that circular sections are seen in transverse sections of the corallum; and this variation is yet more pronounced in specimens from the anabranch of the Burdekin R., near the Big Rocks (E); when the peripheral stereozone in such forms is very thin, one may imagine a relationship to *Mesophyllum*. Specimens from the Fanning R. show all the above variations, but on the whole they are larger.

This species is perhaps closest in internal structure to *"Cystiphyllum" schluteri* (Wedekind) from the upper Honsel beds of Emst, Germany, i.e. at the top of the lower part of the German *Stringocephalus* beds. Those specimens of *"Cystiphyllum" americanum* from the Hamilton (Givetian) of America, which have very little skeletal dilatation are also close, and may be related, as suggested by Etheridge. Some of the slenderer specimens of our species resemble *Microplasma fongi* Yoh from the lower Givetian beds Kwangsi, China, although Yoh's figures (1937, pl. iv, figs. 4-6) do not show a peripheral stereozone. Yoh's *Atelophyllum* (*Cystiphylloides*) *kwangsiense* from the same place resembles some of the larger specimens placed in *"C." australe* herein, in the absence of skeletal dilatation; but Yoh's figure (pl. v, fig. 3a) shows long septal trabeculae not observed in any of the Queensland specimens.

"Cystiphyllum" cf. *pseudoseptatum* Schulz. Pl. VII, figs. 1a, b.

A specimen from the dome in the Fanning R. near the tank in the cow paddock shows great skeletal dilatation in successive zones, and thus suggests comparison or identity with *"C." pseudoseptatum* Schulz (1883, pl. xxiii, figs. 3, 4) from the upper coralline limestone (lower part of the *Stringocephalus* beds) of the Hillesheim Basin in the Eifel, and with *"C." americanum* Edw. & H. (Fenton and Fenton, 1938). Specimens from Burdekin Downs, on the hill behind the fowlyard, and from portion 370, parish of Magenta in the Reid Gap, appear intermediate in internal structure between it and the lectotype of *"C." australe*. The Fanning specimen is turbinate.

FAMILY DIGONOPHYLLIDAE.

Typical Genus, *Digonophyllum* Wedekind.

Large, solitary Rugosa with a greatly lengthened minor septum in the counter fossula, with concave tabular floors of rather globose tabellae, and a wide dissepimentarium of smaller, globose dissepiments. The number of septa is large, and the septa are very variable in development. They may extend from periphery to axis, or they may be withdrawn from periphery or from axis or from both, leaving only occasional traces; they may be dilated in the tabularium or at the periphery, and the dilatation may proceed from the tabularium into the dissepimentarium; yard-arm carinae may develop on the septa or instead of them near the periphery; lateral dissepiments may buttress the septa. The septal development is often strengthened, at different calical floors, both in thickening and trabecular continuity.

Remarks: The family is very important in the Middle Devonian of the Eifel, and good figures of many of its members are given by Wedekind (1921, 1924, 1925), Vollbrecht (1926), Walther (1928) and Wedekind and Vollbrecht (1931). It appears to me to be divisible into two major groups, in one of which the septa are strongly developed, while in the other they are reduced in many ways. These groups contain the following genera from the German Devonian, each interpreted on the genotypes listed in Lang, Smith and Thomas (1940). First group: *Digonophyllum* and *Zonodigonophyllum* from the Nohn beds at the base of the *Calceola* beds of the Eifel, *Mochlophyllum* from the crinoid beds at the base of the *Stringocephalus* beds of the Eifel, *Pseudocosmophyllum* from the upper coralline limestone of Niederehe in the lower part of the *Stringocephalus* beds of the Eifel, and *Enteleiophyllum* from the ?upper part of the *Stringocephalus* beds of

the Sauerland. To these may be added *Uralophyllum* Sochkina from the Middle Devonian of the Northern Urals. These all show long and moderately persistent major septa, but in some the minor septa are impersistent with the exception of the one long one in the counter fossula, which is characteristic of the family. Second group: *Bothriophyllum* from the top of the *Calceola* beds of Heiligenstein in the Eifel, *Lekanophyllum* from the crinoid beds of Auburg at the base of the *Stringocephalus* beds of the Eifel, *Hemicystiphyllum, Hemicosmophyllum* and *Arcophyllum* (= *Cosmophyllum,* preoccupied) from the lower part of the *Stringocephalus* beds of the Eifel, *Mesophyllum* and *Atelophyllum* from Berndorf and the upper Honsel beds of Emst respectively, near the top of the lower part of the *Stringocephalus* beds, and *Dialithophyllum* from the top of the upper Honsel beds of Genna in the Altena saddle. In this group the septa are reduced in various ways, but it is nearly always possible to find the characteristic elongate counter minor septum of the family.

In both groups it is very difficult to evaluate species and genera, and it is possible that many of the genera in each group should be merged. For the purposes of this study each group is regarded as a genus (*Digonophyllum* and *Mesophyllum*), consisting of the sub-genera as named.

It is possible that some of the lower Givetian cystimorphs remarked above on p. 241 have been derived from members of the Digonophyllidae, by total suppression of the septa, i.e. as endpoints of the trends in septal reduction characteristic of the Digonophyllidae. Or, it may be possible, as Wedekind has suggested, that forms with well-developed septa have evolved from forms without septa. Many of the morphological groups distinguished by Wedekind show successive zones of skeletal dilatation, and these Wedekind considered diagnostic of the family Lithophyllidae. But (see p. 242) the present author considers these to be the result of internal structural rejuvenescence, such as is found in greater or less degree in all Rugosa.

The family is common in the Middle Devonian of Europe; it also occurs in Western Siberia and the Transcaucasus. In the Australian Middle Devonian some mesophyllids occur, but none of the group with well-developed septa, and the same appears to be the case in N. America.

Genus *Mesophyllum* Schlüter.

Mesophyllum Schlüter, 1889, p. 325.

Genolectotype (chosen Wedekind, 1925, pp. vii, 28, 38):— *Mesophyllum defectum* Schlüter, 1889, p. 333, pl. vii, fig. 2 (re-figured Wedekind, 1925, pl. 13, fig. 76). Upper Middle Devonian, Eifel, and Berndorf, near Hillesheim, the Eifel.

Diagnosis: Digonophyllids in which the septa are discontinuous and greatly reduced.

Remarks: Wedekind's figure of Schlüter's specimen shows the long minor septum in the counter fossula which is characteristic of the Digonophyllidae. It also shows considerable septal reduction, in that the axial ends of the septa are withdrawn from the axis, while their peripheral ends are replaced by discontinuous cross-bars, and their median segments are often discontinuous. The minor septa are more reduced than the major. The remaining septal segments are moderately thin. The various morphologies within this genus, see above p. 245,

distinguished with generic names by Wedekind and his co-workers, show different degrees of such septal reductions; the groups *Arcophyllum* and *Hemicosmophyllum* show only those types of reduction found in *M. defectum,* and in *Atelophyllum* these are carried further in the absence of the zone of peripheral, discontinuous cross-bars. In *Bothriophyllum, Hemicystiphyllum* and *Dialithophyllum,* peripheral reduction of the septa is slight, and cross-bars do not occur; but a different type of septal reduction, by which lateral dissepiments line the septa, characterises all three. In *Lekanophyllum,* although there is peripheral and axial withdrawal of the septa, there are no cross-bars, and no lateral dissepiments, but the septa may be reduced to a series of cylindrical trabeculae, frequently isolated one from another. The systematic value of these names is doubtful, but in the present paper they are given sub-generic rank. In the German Devonian all of these sub-genera occur in the lower part of the *Stringocephalus* beds of the Eifel, or in the upper Honsel beds of the Altena saddle.

Mesophyllum collare sp. nov. Pl. VII, figs. 2a, b.

Holotype: F 4395, University of Queensland Collection, bed *c* near the top of the Fanning R. limestone, on Fanning R. about 1½ miles upstream from Fanning R. homestead. Givetian.

Diagnosis: Large *Mesophyllum* in which the septa are completely withdrawn from both axis and periphery, leaving a collar of major and minor septal segments near the inner margin of the dissepimentarium; cross-bars are not developed.

Description: The corallum is very large. One fragment has a diameter of 80 mm., and another of 60 mm. The material available shows neither calice nor epitheca, due to weathering. At a diameter of 60 mm. there are segments of 55 major septa and 55 alternating minor septa, developed in a collar in the dissepimentarium, about half-way between the periphery and the axis. The segments may be up to 8 mm. long, and are dilated. Small wedge-like septal crests may be traced beyond each segment, on the upper surfaces of the dissepiments, both towards the periphery and towards the axis, but none of these crests are in the form of cross-bars. There is a wide peripheral zone of lonsdaleoid dissepiments, and a similar but narrower zone occurs at the inner margin of the dissepimentarium. In vertical section the dissepiments are rather steeply inclined, and somewhat globose in their upper parts; they are slightly thickened in successive zones representing some of the past positions of the calice. The tabularium is about 12 mm. wide, and contains rather large tabellae, arranged in concave tabular floors. The tabellae are much less steeply inclined than the dissepiments.

Remarks: None of the specimens figured by Wedekind or his co-workers show exactly this combination of the various types of septal reduction, but some *Atelophyllum* from the upper Honsel beds of Emst in the Altena saddle are fairly close, lacking only the segments of minor septa.

Subgenus *Dialithophyllum* Amanshauser emend. Wekekind.
Dialytophyllum Amanshauser MS emend. Wedekind, 1925, p. 40.

Genotype: D. complicatum Amanshauser MS in Wedekind, 1925, p. 40 p 43, text-fig. 63, topmost Honsel beds, Genna, Germany.

Diagnosis: Mesophyllum with septa withdrawn from the tabularium but continuous in the dissepimentarium, where also they may be buttressed by lateral dissepiments.

Mesophyllum (*Dialithophyllum*) *fultum* sp. nov. Pl. VII, figs. 3, 4.

Holotype: F 4535, University of Queensland Collection, Fanning R., by the cow paddock tank, Fanning R. station. Givetian.

Diagnosis: Mesophyllum with the septa (50 of each order) withdrawn from the axis but not from the periphery, and buttressed by lateral dissepiments.

Description: the corallum is large and trocho-cylindrical, with a diameter in the holotype of 40 mm. The epitheca shows growth annulation and longitudinal striation; the calice is filled with matrix in the three available specimens. At 38 mm. diameter there are 50 major septa extending a little over half way to the axis, and 50 alternating minor septa nearly half this length. The dissepimentarium is as wide as the length of the major septa. All the septa are buttressed by small lateral dissepiments, which inosculate with the normal dissepiments. The septa may be discontinuous just at the periphery and are then represented by discrete, cylindrical or sometimes cross-bar trabeculae. One minor septum, nearly opposite the cardinal fossula, is as long as the major septa. The dissepiments are geniculate in transverse section of the corallum. In vertical section the wide dissepimentarium is seen to consist of small, numerous and fairly steeply inclined plates, while the tabularium contains larger and fewer tabellae, arranged on concave tabular floors. The horizontal elements are dilated in successive zones, representing different positions of the calical floor during growth of the corallum.

Remarks: The species resembles the genotype of *Dialithophyllum* but has many more septa, with also fairly well developed minor septa. The genotype occurs in the topmost Honsel beds of the Altena saddle, in western Germany. These are usually regarded as the very top of the lower part of the German *Stringocephalus* beds.

FAMILY DISPHYLLIDAE.

Disphyllidae; Hill, 1939a, p. 224.

Genus *Disphyllum* de Fromentel.

Disphyllum de Fromentel; Lang and Smith, 1935, p. 554; Hill, 1940b, p. 398.

Remarks: It would appear from the figures that the genotypes of the genera *Megaphyllum, Peneckiella, Pseudostringophyllum* and *Diplophyllum,* all proposed by Soshkina (1939) for fasciculate forms from the Upper Devonian of the Urals might well be species of *Disphyllum* as understood by Lang and Smith. *Megaphyllum* was preoccupied in 1894 for a myriapod, and *Diplophyllum* in 1851 for a coelenterate.

Disphyllum gregorii (Etheridge). Pl. VIII, figs. 1-4.

Campophyllum gregorii Etheridge, 1892. p. 60, pl. iii, figs. 15-18; 1895, p. 522, pl. xl, fig. 2. (Upper Middle) Devonian, Regan's Benwell's and Philp's Quarries, Reid Gap.

Non *Campophyllum gregorii* Chapman, 1912, p. 219, pl. xxxiv, figs. 3-5, which is *"Campophyllum" recessum* Hill, 1940c, p. 254, pl. ix, fig. 7.

Type Material: in the Collection of the Geological Survey of Queensland; the lectotype, here chosen, is F 1655, figured Etheridge 1892, pl. 3, fig. 15, from Regan's Quarry. Givetian.

Diagnosis: Disphyllum with ceratoid to cylindrical corallites with about 30 septa of each order; typically the major septa reach about half-way to the axis, while the minor septa are less than half as long; there is typically one or two series of small, very globose dissepiments, and the septa are dilated so that they extend laterally over the upper surfaces of the dissepiments; typically the tabulae are complete and horizontal, supplemented at the margins by smaller plates; variability is great; the number of series of dissepiments may increase, the septa may become long, and sometimes curved about a small axial space, when the tabulae become incomplete on concave floors; the dilation of the septa varies in amount and position.

Description: The corallum is phaceloid, the corallites arising by peripheral, parricidal increase, or by lateral non-parricidal increase. Ceratoid and cylindrical individuals occur, the cylindrical corallites being trochoid proximally. Cylindrical individuals are usually between 12 and 15 mm. in diameter. The corallites are all more or less rolled and worn, and are found in thin-bedded limestones consisting of transported skeletal matter. The compound coralla are usually broken up into dissociated fragments, so that hystero-corallites are rarely found connected to the parents, the break usually occurring at the junction of parent and hystero-corallite.

There are typically about 30 septa of each order; the major septa extend about half way to the axis, while the minor septa are less than half as long as the major; all the septa are dilated just inside the innermost dissepiments, so that their dilated tissue extends over the tops of these inner dissepiments; in the dissepimentarium itself the septa may be thin, or may dilate wedge-wise towards the periphery; the tabulae are complete, and fairly closely but irregularly spaced, with down-turned margins; or they are supplemented at the margins by small tabellae declined towards them from the dissepimentarium. There are two series of small, very globose dissepiments, but only the outer series is persistent. The trabeculae of the septa can be seen in vertical section to form a single series, about 5 in the space of 1 mm., directed upwards and inwards from the epitheca at about 45°.

There are many fragments from the Reid Gap, which, while of cylindrical form, differ from typical specimens in the position and amount of septal dilatation, and in having four or even five series of dissepiments. Usually the septal dilatation varies from one side of a corallite to another; thus the septa may be dilated wedge-wise towards the periphery from a point just inside the dissepimentarium, or this dilatation may cease at the inner edge of the dissepimentarium, so that the sections of septa within the dissepimentarium are thin; or these sections may again increase in thickness towards the periphery. In some corallites the zone of dilatation at the inner margin of the dissepimentarium may not be continuous from septum to septum, and may sometimes disappear altogether; in this case the septa may be thin throughout, or may thicken wedge-wise towards the periphery.

Other cylindrical fragments from the Reid Gap differ from typical forms in having longer major septa; these major septa may almost reach the axis, and they may be slightly curved in the tabularium; the length of the major septa causes the tabulae to be incomplete, and the supplementary tabellae become larger and more numerous, while the axial tabulae shorten and are usually concave; in vertical sections of such individuals there is a narrow axial area where the successive axial tabulae all are concave to approximately the same extent.

Localities: Burdekin Downs E; Fanning R. A, base and middle sections, F, ?G; Reid Gap A (type), B, C, ?E, F.

Remarks: The species is very variable in the Reid Gap. Frech's figure (1886, p. iii, fig. 3) suggests that *C. caespitosum* var. *breviseptata* Frech from the Refrath beds near Cologne is close to our species. Fliegel (1923) considered these beds to belong to the upper part of the German *Stringocephalus* beds. *D. gregorii* is also close to the European *D. goldfussi* from the Givetian and Frasnian, but differs from the figures of this species given by Lang and Smith (1935) in its septal dilatation and in its typically shorter major septa. Its septal dilatation is quite similar to that of *D. goldfussi* var. *hsianghsienense* Yoh (1937, pl. viii, fig. 1) from the *Stringocephalus* beds of North Kwangsi, but this Chinese form has major septa typically long, whereas in the great majority of Queensland specimens the septa are typically short. There is a close resemblance to species placed in *Cylindrophyllum* by American authors, particularly to *C. panicum* (Winchell)[1] from the top of the Traverse group of Michigan, in beds regarded as probably equivalent to some part of the Givetian of the European succession; but the dilatation of the septa over the inner series of dissepiments, so frequent in *D. gregorii* does not appear to occur in the American species. In *D. panicum* the trabeculae are often expanded laterally to form yard-arm carinae, but in *D. gregorii* the septa merely swell slightly at the trabeculae, in some individuals.

Disphyllum (or *Macgeea*).

Macgeea Webster; Lang and Smith, 1935, pp. 552, 577.

It is convenient to use this nomenclature for members of the Disphyllidae when one cannot ascertain whether they are solitary or fasciculate.

Disphyllum (or *Macgeea*) *trochoides* sp. nov. Pl. VIII, figs. 5-10.

Holotype: F 4557, University of Queensland Collection, Windmill on Fanning R. station, about 3 miles ESE of homestead. Givetian.

Diagnosis: Trochoid corallites with about 30 septa of each order, the major septa typically extending almost to the axis, and the minor septa being half this length; the septa may show ill-developed yard-arm carinae, and are typically rather thin; the dissepimentarium is wide, of small globose dissepiments; the tabulae are incomplete, with an inner series of flat or concave plates and an outer of declined tabellae.

Description: The corallites are trochoid; from the type locality there is no evidence that they were broken from fasciculate coralla, though they occur in thin beds of transported material; some from Burdekin Downs may have been fasciculate; thus two corallites may be joined laterally throughout their course, from apex to calice, or a small corallite may be laterally adherent to a large corallite; others from Burdekin Downs have a talon near the apex, suggesting that they were solitary. No associated difference in internal structure has been noted. The corallites may attain a diameter of 20 mm. in a height of 30 mm. Rejuvenescence occurs in many corallites.

There are 26 to 30 septa of each order. In the type locality the major septa usually reach almost to the axis, though occasionally they may be withdrawn almost to the dissepimentarium; the minor septa

[1]This species was wrongly referred by Hill, 1939a, p. 226, to the Couvinian.

extend nearly two-thirds of the way to the axis. The septa may become ragged, with irregular boundaries and internal spaces, and their trabeculae are frequently rather distant, and extended laterally into rather sporadically developed yard-arm carinae; there may be 6 of these in 3 mm., extending upwards and inwards in a gentle curve away from the epitheca. In the young stage the septa may be dilated to form a peripheral stereozone at the inner edge of the narrow dissepimentarium, as in *D. gregorii,* but in the adult such dilatation has disappeared. The dissepimentarium is wide, nearly two-thirds of the radius, and the dissepiments are small, globose, and often geniculate in transverse section of the corallum. The tabulae are in two series; in the holotype there is an inner series of rather large, distant, flat tabulae, and an outer series of tabellae inclined downwards from the dissepimentarium to the tabulae so that the arrangement is like that figured for *D. goldfussi* by Lang and Smith, 1935, p. 568); this arrangement is pronounced in those individuals with shorter major septa, but when the latter are long the large flat axial tabulae tend to be replaced by more numerous, smaller, arched tabellae.

Localities: Burdekin Downs A, B, D; Fanning R. ?A, C (type), F; Reid Gap A, B, E, ?F.

Remarks: The species shows considerable local variation. Thus in the specimens from Burdekin Downs the tabellae are frequently smaller and more numerous than in specimens from the type area; and in some, the septa are slightly curved in the tabularium, or considerably more dilated in the dissepimentarium. Some specimens from the base of the Fanning R. limestone, which are doubtfully included in the species, have a peripheral stereozone of some regularity. In specimens from the lower bed in portion 370 parish of Magenta, there is a striking resemblance to *D. goldfussi,* for the septa are only rarely ragged, and the major septa usually leave a moderately wide axial space.

D. (or *M.*) *spongiosum* (Schlüter; Wedekind, 1922, fig. 2) from the Büchel beds of Bergisch Gladbach in the Paffrath Basin appears to be very close to our species, but its yard-arm carinae are somewhat more distinct. *D.* (or *M.*) *conicum* (Kettnerova, 1932, p. 55) from the upper Givetian of Moravia, is comparable, but has irregularly yard-armed septa thickened fusiformly at the inner margin of the dissepimentarium, though not so much so as to be in contact. In many individuals the morphology of *D. trochoides* resembles that of the *D. goldfussi* group of the Givetian and Frasnian of Europe, but the dissepimentarium is constantly wider in our species, and the young stage of its holotype shows the septal dilatation characteristic of *D. gregorii,* with which indeed it may prove to be continuously variable.

Disphyllum (or *Macgeea*) *excavatum* sp. nov. Pl. VIII, figs. 11-13.

Holotype: D 42, Geological Survey of Queensland Collection, Burdekin Downs, on the N side of R., within three-quarters of a mile of the homestead. Givetian.

Diagnosis: The corallites are large, trocho-cylindrical and usually somewhat curved; they may attain a diameter of 35 mm. in a height of 30 mm., when rejuvenescence may occur. They appear to be solitary. The calice is deeply concave, and the epitheca, which may be discontinuous at the rejuvenescences, shows deep, narrow longitudinal grooves corresponding in position to the septa, with faint grooves midway between each.

There are from 28 to 34 septa of each order; the major septa extend half-way to the axis, or are a little longer; their axial ends may be rotated slightly; the minor septa are very short in the proximal parts of the corallum, but in the distal parts may be from one-third to one-half as long as the radius; the septa may be somewhat wavy; they are thin in the tabularium but are usually somewhat dilated in the dissepimentarium; in the proximal parts the dilatation is at the periphery, where they are dilated wedge-wise, and at the inner edge of the dissepimentarium, where the dilatation spreads over the dissepiments as in *D. gregorii*; or the septa may be but little dilated at the inner edge of the dissepimentarium, but may thicken gradually wedge-wise towards the periphery from this point. The tabularium is wide, and the tabular floors are deeply concave, with small inclined tabellae outside and concave tabulae inside. The dissepiments are small and globose but never horse-shoe shaped.

Localities: Burdekin Downs B (type); Fanning R. A. (base) ?; and at Mt. Success (L. C. B. Coll); Reid Gap E.

Remarks: The Reid Gap individuals suggest by their aggregation that they may be parts of a phaceloid corallum. Frech's figure (1886, pl. v, fig. 24) of *Cyathophyllum bathycalyx* Frech from the crinoid shales of Muhlberg near Gerolstein, suggests that this one of his syntypes is close to our species. These crinoid shales are presumably at the base of the lower part of the *Stringocephalus* beds of Germany.

FAMILY ENDOPHYLLIDAE.

Endophyllidae; Torley, 1933, p. 633.

Typical Genus, *Endophyllum* Edwards and Haime.

Sub-fasciculate, cerioid or plocoid Rugosa with a lonsdaleoid dissepimentarium and domed tabulae with upturned edges, the major septa being vortically arranged about a small axial space.

Endophyllum and *Sanidophyllum* Etheridge (1899, p. 154) which occur together in the Givetian of New South Wales, appear to be closely related. *Sanidophyllum* differs from *Endophyllum* in having the tabularia naked of dissepiments for the most part, but united at intervals throughout the corallum by dissepimental platforms, which are very thin and form cerioid calical floors, over which the septa are dilated and laterally contiguous.

Genus *Endophyllum* Edwards and Haime.

Endophyllum Edwards and Haime; Jones, 1929, p. 84.

Genolectotype: Endophyllum bowerbanki Edwards and Haime; chosen Schlüter, 1889, p. 51.

Diagnosis: Sub-phaceloid, cerioid or plocoid Rugose corals in which the septa are discontinuous and dilated within the dissepimentarium, where they are developed as septal crests on the dissepiments. The tabulae are incomplete, and the tabular floors are domes with upturned margins. The dissepiments are large and lonsdaleoid. The major septa are arranged in a vortical axial structure, hollow at the axis.

Remarks: The genotype is an aphroid species, there being no wall between the corallites, which are in contact by means of dissepimental tissue. Its neotype is from the Upper Devonian of Rocky Valley, Torquay, but the type was from the Givetian or Frasnian of Barton, near

Torquay. Its distribution is not known, as it is not mentioned in the Survey Memoirs on Torquay and Newton Abbott. Schlüter (1889, p. 52, pl. vi, figs. 1-3) identified with it his *Darwinia perampla* from the German *Stringocephalus* beds, and Torley (1933) has considered *Ptychophyllum palmatum* Maurer from the Waldgirm limestone to be identical with it.

A cerioid species, *E. abditum* Edwards and Haime was collected from a beach pebble at Teignmouth, and is from an unknown horizon in the English Devonian. The cerioid *E. yunnanense* Mansuy (1912, p. 48) is from the Middle Devonian (Eifelian) of Yun-nan, S. China.

In the New South Wales Givetian, *Endophyllum* is represented by both cerioid and aphroid forms; the aphroid form is *E. schlüteri* Etheridge (1898, p. 43, pls. iv, v) and is possibly conspecific with *E. bowerbanki*; and the cerioid form is *E. schlüteri* var. *colligatum* Etheridge (1920, p. 55, pl. xiii), which is extremely close to if not conspecific with *E. abditum*. The specimens described below from the Fanning R. belong to this cerioid group.

Endophyllum abditum var. *columna* nov. Pl. VIII, fig. 14; pl. IX, fig. 1.

Holotype: F 4275 University of Queensland Collection, top of limestone, Fanning R., 1½ miles upsteam from homestead. Givetian.

Diagnosis: Cerioid *Endophyllum* with septa typically not extending outside the tabularium, which appears as a fairly regular column.

Description: The corallum is cerioid, the average diameter of the corallites of any one corallum varying from 12 to 22 mm., and in the one corallum the corallites are unequal. There are 23 septa of each order, thin throughout and confined to the tabularium; the major extend towards the axis, showing a slight but somewhat irregular vortical curvature, and leaving a rather irregular axial space. The minor septa are seen as short ridges on the wall of the tabularium, a wall formed by the innermost series of dissepiments. Rarely the septa may be continued as crests on the outer dissepiments and common outer wall of the corallites. The dissepiments are very large, and rather steeply inclined. The tabularium is on the average 7 mm. wide; the tabulae are flattened domes with upturned margins, reinforced occasionally with smaller plates at the margins or on the domes.

Remarks: This species belongs to the group of *E. abditum*. It differs from *E. abditum* figured by Jones (1929, pl. x., figs. 3, 4) in having its septa confined to the tabularium, which is relatively narrow, in the smaller number of septa, and in the absence of trabecular differentiation of the septa; also, its septa are thin. It differs from the N.S.W. species *E. colligatum* in the same ways.

FAMILY FAVISTELLIDAE (OR COLUMNARIIDAE).

Favistellidae (or Columnariidae); Hill, 1939b, p. 241; 1940a, p. 155; 1940c, p. 262.

Genus *Favistella* Hall.

For a discussion of the taxonomy of *Favistella* and *Columnaria* see Lang and Smith 1935a, and Hill, 1939b, p. 240; 1940a, p. 155. Weissermel (1897, p. 873) has reviewed species which he considered generically related to *Columnaria alveolata* Hall. He distinguished two groups, one with walls as in *C. alveolata* (i.e. *F. stellata,* the genotype of *Favistella*), and the other with thick walls, including

Cyathophylloides rhenanum Frech. This thick-walled group, which consisted of two solitary, two phaceloid and one cerioid species, he placed in the subgenus *Pycnophyllum* Dybowski, this name being an invalid correction for *Densiphyllum* Dybowski. He has recently (1938, p. 68) added a second cerioid species. Lang, Smith and Thomas (1940, p. 49) have shown that *D. thomsoni* Dybowski is genolectotype for *Densiphyllum*. But this is a solitary species and I doubt that it is congeneric with the compound forms. Dybowski's figures suggest that it is a Streptelasmid. Until material can be assembled for a critical revision of all these thick-walled forms, the most reasonable course appears to be to consider the compound species under the genus *Favistella*.

Favistella rhenana (Frech). Pl. IX., figs. 2, 3.

Cyathophylloides rhenanum Frech, 1886, p. 207, pl. xv., figs. 19, 19a; upper *Stringocephalus* limestone (beds with *Uncites gryphus*) near Hand in the Paffrath Basin, and at the same horizon at Brilon.

Type Material: Possibly at Breslau.

Diagnosis: Thick-walled phaceloid *Favistella*; two opposite septa of the 18 major septa are longer than the others.

Description: The corallum is phaceloid, the corallites being long and straight, and usually from 6 to about 10 mm. in diameter, with a smooth epitheca. Increase is peripheral and may be parricidal. The wall is on the average 1 mm. thick. There are from 16 to 20 major septa, usually 18, of which two opposite ones are frequently longer than the others and thus divide the corallite into two halves; the others are unequal and may be somewhat curved. The alternating minor septa project but little beyond the wall. The septa are moderately thick in the tabularium, but expand greatly at the periphery so that they are closely in contact and thus form the thick wall. The tabulae are thin, rather distant and complete, usually slightly domed, and sometimes with an axial depression. There are no dissepiments.

Localities: Burdekin Downs B; Fanning R. A (beds e-g), B, G; Reid Gap D.

Remarks: I can find no difference between a specimen kindly sent by Prof. W. Weissermel from Schwelm in Westphalia, and those from North Queensland. In the Paffrath Basin, in addition to the type horizon, it occurs (Fliegel, 1923, p. 370) in the *quadrigeminus* (upper Honsel) beds. Sochkina has described two very similar species from the Urals, one, *F. vulgaris* (Sochkina, 1936, p. 22) from the Givetian and the top of the Silurian (Sochkina, 1937, pl. ii., figs. 4, 5) and the other *F. quadriseptata* (Sochkina, 1937, pl. ii., figs. 2, 3) from the top of the Silurian. Possibly *Thamnophyllum murchisoni* of Le Maitre (1937, pl. vii., fig. 12) from the Givetian of Ville-Dé-d'Ardin is a *Favistella* near *rhenana*.

Genus *Fasciphyllum* Schlüter.

Fasciphyllum Schlüter; Lang and Smith 1935, p. 548; Hill, 1939a, p. 241; 1940a, p. 155.

Fasciphyllum ryani sp. nov. Pl. IX, figs. 4, 5.

Holotype: F 5018, University of Queensland Collection, anabranch of Burdekin R., near Big Rocks, Burdekin Downs station. Givetian.

Diagnosis: Fasciphyllum with corallites about 6 mm. in diameter, and with dissepiments whose curvature in vertical section approximates a right angle.

Description: The corallum is phaceloid, and increase is peripheral and non-parricidal; the corallites are unequal, from 3 to 9 mm. in diameter, the average being 6 mm. They may be in contact or up to 4 mm. apart. There is a narrow peripheral stereozone about 0·5 mm. wide. There are 14 to 17 slightly unequal major septa which extend to or almost to the axis, and which are somewhat wavy in the tabularium. The alternating minor septa are from half to two-thirds as long as the major septa. The septa are thin except where they expand at the periphery to form the stereozone. The dissepiments are in single series, but this may be reinforced either at the periphery or near the tabularium by much smaller plates; in vertical section they give a curve which closely approximates a right angle; that is, near the periphery it is almost horizontal, but at the tabularium it suddenly curves downwards so that it is almost vertical. The dissepiments do not interrupt the septa except where increase is about to occur. The tabulae are complete, concave and rather distant, except in the proximal parts of young corallites, where they are slightly domed, and extend from stereozone to stereozone without the intervention of any dissepiments.

Localities: Burdekin Downs E (type); Reid Gap E, and Calcium.

Remarks: The inclination of the dissepiments distinguishes this species from others of the genus.

FAMILY SPONGOPHYLLIDAE.

Spongophyllidae; Hill, 1939b, p. 58; 1940c, p. 267.

Genus *Spongophyllum* Edwards and Haime.

Spongophyllum Edwards and Haime; Hill, 1939, p. 60.

Three of the cerioid Middle Devonian species previously placed in the genus (Hill, 1939b, p. 60) appear to form a morphological sub-group to which our species described below may be added, although it is phaceloid. They are *Spongophyllum kunthi, S. parvistella* and *S. ligeriense.* All have a peripheral stereozone, and in all, when lonsdaleoid dissepiments occur, the stereozone is frequently developed on their upper surfaces. The first two are lower Givetian and the third transitional from Coblenzian to Couvinian. Our new species is more like the Lower Givetian forms than the earlier one, which sometimes has one of its septa longer than the others and slightly dilated at the axial end. In *S. parvistella* a morphology like that of the Favistellidae is seen in the proximal parts of the oldest corallites of a colony.

Spongophyllum immersum sp. nov. Pl. IX, figs. 6a, b.

Holotype: Z 82 in the Geological Survey of Queensland Collection from Arthur's Ck., Burdekin Downs. Givetian.

Diagnosis: Phaceloid *Spongophyllum* with a peripheral stereozone with minor septa infrequently suppressed, and with lonsdaleoid dissepiments irregularly developed, and frequently with a narrow stereozone on their upper surfaces; there are several series of dissepiments inside the zone of lonsdaleoid dissepiments.

Description: The holotype, the only specimen collected, is a phaceloid corallum immersed in a stromatoporoid. Most of the corallites are from 4 to 6 mm. in diameter, but some are smaller and a few are larger;

they are at least 40 mm. long (the length of the specimen) and straight; the distance between them varies between nil and 6 to 10 mm. The manner in which the new corallites arise was not observed.

Most corallites have a peripheral stereozone about 0·05 mm. wide, but in some it is narrower. There are 14 or 15 major septa, extending unequally to the axis, and somewhat wavy in the tabularium. The minor septa are about half as long as the major septa, and are occasionally suppressed, or at least become discontinuous between dissepiments. Individual trabeculae are not distinguishable in the septa, which are thin except where they expand into the stereozone at the periphery or on the upper surfaces of lonsdaleoid dissepiments. These lonsdaleoid dissepiments are frequently but irregularly developed, and may form a peripheral zone 2 mm. wide. They are large and globose, but smaller, highly inclined dissepiments are developed in the interseptal spaces between them and the tabularium. The tabulae are typically complete, close and concave, and sometimes with a median deepening, when they may be reinforced by an outer series of tabellae.

Remarks: This species is closely similar in internal structure to *S. kunthi* and *S. parvistella* from the lower part of the German *Stringocephalus* beds, but these are cerioid, whereas the Queensland species is phaceloid.

Genus *Grypophyllum* Wedekind.

Grypophyllum Wedekind, 1922, p. 13; 1925, p. 16; *partim*; Hill, 1940c, p. 267.

Grypophyllum sp. Pl. IX, figs. 7a, b.

Figured specimen, F 4501, University of Queensland Collection, base of Fanning R. limestone, Fanning R. about 2 miles above Fanning R. homestead. Givetian.

Description: The only specimen is of cylindrical corallites from 8 to 12 mm. in diameter, aggregated as if in a compound corallum. There is a narrow peripheral stereozone 1 mm. wide formed by the sudden expansion of the peripheral ends of the septa. There are 23 septa of each order, all rather thin except in the peripheral stereozone; the major septa extend to the axis, where those from two opposite sides of the corallite interdigitate; the minor septa are half as long as the major, when fully developed, but some of them are withdrawn to the periphery, leaving large inosculating dissepiments; in other loculi the dissepiments are normally curved or geniculate. In vertical section the dissepiments are in two zones, an outer of more steeply inclined plates than an inner. The tabular floors are flat lying, and are formed of small, close, flat-lying tabellae.

Remarks: The internal structure of this coral is almost identical with that of *Grypophyllum normale* Wedekind (1925, fig. 25) from the *quadrigeminus* beds of Hand, in the Paffrath Basin, near Cologne.

Grypophyllum compactum sp. nov. Pl. X, figs. 1-4.

Holotype: F 5317, University of Queensland Collection, portion 81v, parish of Wyoming, lower part of limestone, Reid Gap. Givetian.

Diagnosis: The corallum is phaceloid, the corallites being unequal, 5 to 20 mm. in diameter, arising by lateral increase. Calice and epitheca have not been seen. In corallites of average size (about 14 mm.), there are 23 perfectly developed thin minor septa alternating with 23 long

major septa; in larger corallites there may be 29 each; the septa are dilated at their bases to form a narrow peripheral stereozone about 1 mm. wide, but inside this they are moderately thin, becoming thinner towards the axis. The major septa extend somewhat unequally to the axis, where those from opposite sides may interdigitate; the minor septa may be a little more than half as long as the major. The septa in the largest corallite are slightly carinate, with xyloid carinae. The dissepiments are small and somewhat globose, and those of the outer series are more steeply inclined than those in the inner series. The tabularium is narrow, and the tabular floors are almost flat, being either slightly arched or saucered, and are formed by small, closely spaced, flat-lying tabellae.

Remarks: The septa of this species are very like those figured for *Grypophyllum tenue* Wedekind (1925, fig. 27) from the *quadrigeminus* beds of Hand in the Paffrath Basin, and further examination of material of both species may prove them identical.

Genus *Stringophyllum* Wedekind.

Stringophyllum Wedekind, 1922, p. 8; 1925, p. 64.

Neospongophyllum Wedekind, 1922, p. 10; 1925, p. 25; genotype, *Neospongophyllum variabile* Wedekind, 1922, p. 12, text-fig. 11; 1925, text-fig. 90, *quadrigeminus* beds of Hand, Paffrath Basin.

Loepophyllum Wedekind, 1925, p. 55 (as *Loipophyllum*) genotype, *L. kerpense* Wedekind, id., text-figs. 80, 81. Kerp (? middle coralline limestone), Middle Devonian, Eifel.

Schizophyllum Wedekind, 1925, p. 59, genotype *Spongophyllum büchelense* Schlüter, Büchel beds, Büchel, Paffrath Basin. *Schizophyllum* was pre-occupied in 1895 for a myriapod.

Grypophyllum Wedekind, 1922, p. 13, and 1925, p. 14, *partim*, i.e. *Cyathophyllum isactis* Frech and *G. schwelmense* Wedekind, from the upper part of the *Stringocephalus* beds of Germany.

Genotype: Stringophyllum normale Wedekind, 1922, p. 9; *Stringocephalus* limestone of Sundwig; and (*quadrigeminus* beds of) Hand, Paffrath Basin, Rhenish Prussia.

Diagnosis: Rugose corals in which the rather thick septa are arranged bisymmetrically about an elongate axial pit in the plane of the cardinal and counter septa; each septum consists of a single series of discrete or laterally contiguous monacanths from about 0·3 to 0·6 mm. in diameter, and the tabulae are concave, each with an elongate axial pit; the septa may withdraw from the periphery, or become discontinuous in the peripheral region, when lonsdaleoid dissepiments may develop; the minor septa are typically more discontinuous than the major septa.

Range: The genus is characteristic throughout the *Stringocephalus* beds of Germany; it also occurs in the lower Givetian of Kwangsi, China (Yoh, 1937) and in the upper Givetian of Moravia (Kettnerova, 1932). It extends as low as the Chaudefonds limestone of France, which Le Maitre (1934) regards as transitional between Coblenzian and Couvinian. I have not recognised it from Africa or the Americas, but it is characteristic of the Givetian of Queensland.

Remarks: There is in the north Queensland *Stringocephalus* beds a number of forms in which moderately thick septa are arranged bisymmetrically about an axial depression. Each septum consists of a single series of monacanths about 0·3 or 0·6 mm. in diameter. In all forms the axial depression is elongated in the plane of the counter and cardinal septa and deepens the already concave tabulae, which are usually complete. Certain variations are characteristic of the group. The most striking is that the monacanths in a septum tend to become separated; the second is that the septa tend to withdraw from the periphery; the third is that this withdrawal affects the minor septa more than the major septa, and in the limiting cases the minor septa are completely suppressed. With the withdrawal of the major septa is associated the development of lonsdaleoid dissepiments at the periphery. There is also some variation in the thickness of the septa, and occasionally a tendency for the withdrawal of the septa from the axis. All of the north Queensland specimens of the sub-groups which I take to be species, within this group, possess all these types of variability, the differences being merely in degree, and it seems to me to be best to recognise the whole group as a genus. It will be seen that with the exception of the pronounced bisymmetry of the tabularium, and the septal structure of large monacanths, these characters are those diagnostic of *Spongophyllum;* and our forms are therefore regarded as members of the family Spongophyllidae.

The same group occurs in Germany, and has there been split up into a number of genera by Wedekind. What I regard as a genus in Australia, he regards as a family (Stringophyllinae) in Germany, and the merits of the two systems must be tested by their practicability. Wedekind's genera may be analysed in terms of the types of variability outlined above, as follows.

Stringophyllum; withdrawal of septa affects only minor septa, consequently the appearance of lonsdaleoid dissepiments is rare; separation of monacanths is but little operative.

In his *Schizophyllum* (this name is pre-occupied) the dominant variation is that of the separation of the monacanths, but withdrawal of the septa from the periphery is also effective, the minor septa being affected but little more than the major, and lonsdaleoid dissepiments are fairly common.

In his *Neospongophyllum* the dominant variable is the withdrawal of the septa and the occurrence of lonsdaleoid dissepiments; typically there are still traces of minor septa.

His *Loepophyllum* differs from his *Neospongophyllum* in the typically complete suppression of the minor septa. (Possibly Schlüter's *Spongophyllum torosum* and *S. elongatum* are of this morphology, also *S. rosiforme* Yoh, 1937, pl. vi., fig. 1 from the lower Givetian of Kwangsi, S. China). In both these genera there is a slight tendency to separation of the monacanths.

His Grypophylla with thickened septa, which however he placed in a different family from the Stringophyllinae, show complete major septa, and typically, therefore, no lonsdaleoid dissepiments; those without minor septa he placed in *Grypophyllum isactis* (Frech), and those with traces of minor septa in the inner part of the dissepimentarium he referred to *G. schwelmense*.

It will be seen that his system of generic names does not cover all the mathematical combinations of these lines of variability, but perhaps not all such variations occur in Germany. I have been unable so far to examine individuals from Germany in the large numbers necessary for an independent evaluation of species limits and the variation within species in that country. Wedekind has suggested lines of evolution within the group, but his papers give no discussion on the limits of variability within species, and consequently his lines of evolution cannot be independently evaluated. Examination of collections from other localities and horizons in Germany than those studied by Wedekind is also required.

It should be noted that in this genus the appearance of the tabulae in vertical section will vary according to the orientation of the section. Thus if they be cut at right angles to the cardinal-counter axial depression, the tabulae will show this depression centrally; if this type of section be taken through both alar fossulae, these alar depressions will widen the central one; if the tabulae are cut parallel to the axial depression, they will appear either horizontal, or with but a shallow axial depression, or in some cases, will even appear to be domed.

Stringophyllum quasinormale sp. nov. Pl. X, figs. 5-9.

Holotype: F 4528, University of Queensland Collection, base of Fanning R. limestone, 2 miles upstream from Fanning R. homestead. Givetian.

Diagnosis: Cylindrical *Stringophyllum* with about 38 major septa typically continuous, and minor septa more or less continuous, being frequently represented by long septal crests; with monacanths only infrequently separate, and with almost horizontal, complete, axially depressed tabulae.

Description: The corallum is cylindrical and fairly straight, usually about 15 mm. in diameter, but sometimes a little more or less. All specimens are fragments, and it may be that the corallum is phaceloid, although there is no direct evidence of this. Some slight growth constrictions and expansions are characteristic, but the epitheca is continuous across them. The epitheca shows faint growth annulation and longitudinal striation. The fragments from the different localities show slightly different characters and will be described below in groups.

Type locality: The holotype is the only specimen from the type locality. It is about 20 mm. in diameter, and has 42 major septa and an equal number of minor septa; both orders are moderately thickened; the major septa are arranged more or less bisymmetrically about the cardinal-counter plane, and most of them reach the axial plane. Those near the cardinal and counter and two alar fossulae have their axial ends curved towards these fossulae, but the remainder are directed towards the appropriate points along a narrow space elongated in the cardinal-counter plane. The counter septum is longer than the cardinal, and its two neighbouring minor septa are longer than the other minor septa, which are from half to two-thirds as long as the major septa. The major septa are continuous from periphery to axis, but the minor septa which are thinner than the major, are discontinuous here and there and are represented by segments based on dissepiments. Where the minor septa are discontinuous the dissepiments cross the loculi from one major septum to its neighbour. No monacanths are distinguishable in the transverse section figured in plate X, fig. 5a, but they can be traced in the vertical section, fig. 5b. They are contiguous, and are about 0·5 mm.

in diameter, directed upwards and inwards from the periphery at an angle of about 45°. The dissepiments are arranged in about ten series, and are rather large, the inner ones being more steeply inclined and longer than the outer. The tabulae are complete, moderately distant, and slightly concave, with an axial depression which is elongated along the counter-cardinal plane.

Limestone dam, Burdekin Downs. At this locality, whence we have the most specimens of the species (about 30), where the fragments are of a slightly smaller diameter, and the usual number of septa is 38 of each order, we find considerable variation; in some individuals the minor septa are as infrequently discontinuous as in the holotype; in others there are many discontinuous, when the dissepiments stretch right across the loculi between one major septum and the next, and the minor septa are represented as long crests on the dissepiments; in others again some of the major septa have withdrawn a little from the periphery, and a few lonsdaleoid dissepiments are consequently found. In general the thickness of the septa is a little greater than in the holotype. Usually monacanths are indistinguishable in the transverse section, though clearly visible in the vertical section, where they are seen to be usually of a diameter of 0·5 mm., and to make an angle of 45° to the epitheca; occasionally separate monacanths can be seen in transverse section however. The dissepiments and tabulae are as in the holotype.

Anabranch of the Burdekin R., near Big Rocks, Burdekin Downs. One specimen differs from the holotype only in having slightly thicker septa, in which the monacanths are occasionally discernible in transverse section, whether contiguous or separate. The septa are also in part slightly withdrawn from the axis. A number of specimens with slightly different characters which occur at this locality are described below as a variety, *ana.*

Portion 370, parish of Magenta, Reid Gap. Two specimens (F 5251 and F 5294) differ from the holotype only in the greater thickness of the septa; the first shows slight withdrawal of some septa from the axis. Two other specimens (F 5247 and F 5299) show almost complete withdrawal of the minor septa, occasional separate monacanths, and a withdrawal of the septa from the axis, where there are ends of several separate monacanths.

Portion 54, parish of Wyoming, Reid Gap, F 5259, the only specimen, differs from the holotype only in that the minor septa are completely withdrawn and there are several separate monacanths visible in the transverse section.

Localities: Burdekin Downs E, F; Fanning R. A (type); Reid Gap E, F.

Remarks: Within the individuals comprised in the species, from the various localities, the limits of variability in those four directions proper to the genus are:—withdrawal of the minor septa is typically very slight, but it may be complete; withdrawal of the major septa is typically very slight, so that only occasional lonsdaleoid dissepiments are developed; separation of the monacanths is unimportant, but may occur; there may be slight withdrawal of the septa from the axis. The number of septa of each order is typical, usually 38, but not less than 33 and not more than 42; the cylindrical, fairly straight form is typical also.

This north Queensland species has amongst its individuals some which are practically identical in transverse section with Wedekind's figured specimen of *S. normale,* from the *Stringocephalus* limestone of Sundwig, Germany, but our specimens do not show any vertical inner dissepiments (which Wedekind has described as an outer series of tabulae), such as are figured for the genotype. And as we do not know the limits of variation in the genotype, which is larger (nearly 30 mm. in diameter), I do not feel that specific identity is established between the north Queensland species and the German.

Stringophyllum quasinormale ? var. Pl. X, figs. 10a, b.

Holotype: F 5087, University of Queensland Collection, limestone dam on Burdekin Downs station. Givetian.

Diagnosis: Large *Stringophyllum quasinormale,* with more numerous septa (up to 47 of each order) and some lonsdaleoid dissepiments.

Description: The corallum is thick and somewhat vermiform. The holotype is 30 mm. and the other two specimens from the type locality are 20 mm. in diameter. The holotype has 47 major septa, and the other two 44 and 40. In the holotype the minor septa are occasionally withdrawn and discontinuous, long crests being based on the dissepiments. In some places also the major septa are discontinuous and lonsdaleoid dissepiments are formed. In the two smaller specimens the minor septa are much less continuous. Some separate monacanths can be found. The major septa are long and reach right to the axis, the arrangement of their axial ends being as in *S. quasinormale,* and not at all withdrawn from the axis; in the holotype they tend to be somewhat sweepingly curved. The dissepiments are as in *S. quasinormale,* but the tabulae, in the only vertical section cut, are V-shaped and complete.

Remarks: These three specimens, while much larger than those typical of *S. quasinormale,* and having more septa, yet have a morphology closely comparable to that species, and at most are probably only to be regarded as a variety thereof. These large specimens are known only from one locality, where they occur with numerous specimens of the species itself. As so few specimens are known, they are not given a varietal name. They probably indicate the age of the *quadrigeminus* beds of Hand or the *Stringocephalus* limestone of Sundwig in Germany.

Stringophyllum quasinormale var. *ana* nov. Pl. X, figs. 11-14.

Holotype: F 5011, University of Queensland Collection. Anabranch of the Burdekin R., near Big Rocks, Burdekin Downs Station. Givetian.

Diagnosis: Small *S. quasinormale* in which there are fewer septa (32 to 38 of each order), and in which the minor septa are frequently entirely withdrawn.

Description: About 30 cylindrical and somewhat vermiform fragments suggest that the corallum may have been phaceloid, although no offsets were found. Most are somewhat weathered, though a few show the epithecal characters of *S. quasinormale.* In diameter they vary from 10 to 15 mm. In about half of the specimens, the minor septa are represented by crests on the dissepiments; in most coralla these occur somewhat sporadically, but in some they form a fringe round the inner

part of the dissepimentarium. In the other half of the specimens, traces of minor septa are either absent or rare. The specimens with the smaller diameters are usually those without minor septa, but not always. The septa are typically thinner than in *S. quasinormale* itself, and are finely wavy. The dissepiments and tabulae are similar to those in *S. quasinormale*. Separation of the monacanths is only occasionally observed. Many of the specimens have been crushed so that the septa near one diameter have been smashed together.

Remarks: The smaller average size and the frequency with which the minor septa are completely withdrawn distinguish some thirty specimens from the anabranch of the Burdekin R. near Big Rocks as a variety of *S. quasinormale*. One or two specimens from the locality however are of *S. quasinormale* itself.

Stringophyllum bipartitum sp. nov. Pl. XI, figs. 1-3.

Holotype: F 4398, University of Queensland Collection, beds a-g limestone in Fanning R. 1½-2 miles above Fanning R. house; Givetian.

Diagnosis: Very large *Stringophyllum* with 50-58 major septa, extending irregularly nearly to the elongate axis, and typically withdrawn in part from the periphery so that irregular lonsdaleoid dissepiments occur; minor septa are occasionally present, as septal crests; the monacanths are sometimes separate.

Description: The corallum is large, diameters up to 40 mm.. being found, though 30-35 mm. is the average. No offsets have been seen, but from the association of individuals in the matrix it is thought that the species might be compound. One fragment is 15 cm. long. Growth constriction and swellings are frequent. There are from 50 to 58 major septa, which extend irregularly to the elongate axis characteristic of the genus; they are moderately thick and are irregularly withdrawn from the periphery so that lonsdaleoid dissepiments occur frequently. They may be represented by separate monacanths in their peripheral parts, or near the axis. The counter septum is frequently longer than all the others. Minor septa are only occasionally developed, as crests on the dissepiments, or as a series of separate monacanths. The dissepiments and tabulae are as is characteristic for the genus; the dissepiments are more globose and less steeply inclined in the outer series than in the inner. The tabulae are typically complete, and are concave with an axial deepening in the plane of the cardinal and counter septa.

Localities: Fanning R. A (a-g type), B, E; Reid Gap D.

Remarks: The species somewhat resembles *S. büchelense* (Schlüter) of Wedekind (1925), from the upper Honsel beds of Genna, Germany; but this Genna specimen shows a better development of minor septa and a greater tendency to separation of the monacanths.

Two specimens F 4394 and F 4400, occurring with this species at its type locality have a greater diameter (50 mm.) and more septa (66 to 70). They show a wider axial space than is typical, and a fair development of crests on the minor septa. They may represent a variety, but we have too little material to judge.

Stringophyllum irregulare sp. nov. Pl. XI, figs. 4-8.

Holotype: F 4904, University of Queensland Collection, Burdekin Downs station (fence running north from the east end of the night paddock). Givetian.

Diagnosis: Stringophyllum with about 40 major septa, usually somewhat withdrawn from the periphery, with irregular development of lonsdaleoid dissepiments; minor septa are typically absent and major septa frequently withdrawn from the axis; separation of the monacanths is occasionally observed.

Description: The corallites are all cylindrical fragments without offsets, so that we do not know if the corallum be solitary or compound. Some talon-like processes are seen on some specimens, and some fragments are of small diameter (13 mm.) compared with the average (20 mm.), although they have the same number of septa (40), suggesting that the species is compound. Most fragments are rather worn externally, but some show the epitheca with faint growth annulation and longitudinal striation, and small irregular growth swellings and constrictions. There are on the average 40 moderately thick major septa, which may extend from the epitheca to the elongate axis characteristic of the genus, but usually they are irregularly withdrawn from the periphery, so that lonsdaleoid dissepiments are developed. The septa may occasionally be rather irregularly curved in the tabularium, but typically they have the arrangement characteristic of the genus, although frequently they are somewhat withdrawn from the axis also. Their monacanths may occasionally be separate. The dissepiments and tabulae are those characteristic of the genus; in some individuals the dissepiments are more globose and less steeply inclined than in others.

Localities: Burdekin Downs D (type), F; Fanning R. A. (beds h-j), F, ?G; Reid Gap E, G.

Remarks: In its internal structure this species is perhaps most closely similar to *S. tenue* (Wedekind, 1925, figs. 74, 75) from the old calamine mine red earth near Schwelm, i.e. probably in the upper part of the German *Stringocephalus* beds, although his figures show more frequent separation of the monacanths than in our form. There is the same size of corallum and number of septa. There is also a close morphological resemblance to the specimens from the lower part of the German *Stringocephalus* beds of Kerp and Baarley, placed by Wedekind (1925, pl. 14) in *Loepophyllum*. Our species is also comparable with *S. torosum* (Schlüter) from the lower part of the *Stringocephalus* beds at Berndorf, as figured by Schlüter (1881, pl. vi, figs. 1-5), although this has fewer septa (35) and a narrower dissepimentarium. It does not appear to resemble at all closely the specimens figured as *Spongophyllum torosum* Schlüter by Le Maitre (1934, pl. vi, figs. 3-6) from the Chaudefonds limestone transitional between Coblenzian and Couvinian.

One specimen from the type locality for *S. irregulare*, and two from the limestone dam on Burdekin Downs, are similar to the species except that there are more major septa, 44 to 46, and these are only seldom withdrawn from the epitheca, and then very slightly. As they are so few, they are doubtfully referred to *S. irregulare*.

Stringophyllum isactis (Frech). Pl. XI, figs. 9-11.

Cyathophyllum isactis Frech, 1886, p. 75 (189), pl. i, fig. 7, pl. ii, figs. 13-18, *non* fig. 19; upper *Stringocephalus* beds of Schladetal in the Paffrath Basin, and Soetenich in the Eifel.

Grypophyllum isactis (Frech), Wedekind, 1922, p. 15, Büchel beds near Hand, Paffrath Basin; Wedekind, 1925, p. 17, figs. 12-14, Massenkalk of Schladetal; and Soetenich.

Type material is probably at Berlin or Breslau.

Diagnosis: Phaceloid *Stringophyllum* with corallites about 10 mm. in diameter; there are 28 slightly thickened major septa, minor septa being typically completely withdrawn; the major septa sometimes withdraw so that lonsdaleoid dissepiments form; separation of the monacanths occasionally occurs.

Description: The corallum is phaceloid, increase being by one or sometimes two offsets arising in the outer dissepimentarium and growing laterally without killing the parent. The corallites are from 8 to 12 mm. in diameter, have slight changes in direction of growth and show slight irregular growth swellings. The outer tissue may project in talon-like processes, anchoring one corallite to its neighbour. The epitheca shows only very faint growth annulation and longitudinal striation. There are 28 or 30 major septa, which are usually moderately thick; they nearly reach an elongate axis, being slightly withdrawn so that there is an oval axial space in many transverse sections, in which however, sections of separate monacanths may be seen. Occasionally the major septa may withdraw from the periphery, so that lonsdaleoid dissepiments develop, particularly where offsets or anchoring processes arise. Usually individual but contiguous monacanths may be distinguished in the septa, although occasionally they may be separate. They are about 0·6 mm. in diameter. Only very occasionally traces of minor septa occur. The dissepiments are large and globose, particularly in the connecting processes, usually in one to three series, the inclination of the innermost becoming almost vertical. The tabulae are typically concave, complete, with an axial deepening in the cardinal-counter plane; small plates may develop across this depression.

Remarks: Many of the specimens from the top of the Fanning R. limestone are identical in internal structure with *S. isactis* (Frech) as figured by Wedekind (1925, p. 19, fig. 12) from Schladetal (Massenkalk, upper part of the German *Stringocephalus* beds). The species also occurs in the upper Givetian of Moravia (Kettnerova, 1932, figs. 30-32). *Cyathophyllum* cf. *isactis* Frech has been recorded from the Givetian and Upper Devonian of Russia by Lebedew (1902, p. 150), but his figures (pl. iii, figs. 43-44) show a morphology rather different from the German species.

F 4962 from Burdekin Downs homestead, on the hill rising from the fowlyard, may belong to the species; it has 29 major septa, and some lonsdaleoid dissepiments, but it is somewhat larger in diameter than the corallites from the Fanning R., with a wider dissepimentarium of smaller dissepiments. It is only a fragment, and it is not known whether it is from a phaceloid corallum or is a solitary individual.

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EXPLANATION OF PLATES.

Plate V.

Except where otherwise noted, the specimens are all in the University of Queensland Collection.

All figures × 1·8 diameters.

Acanthophyllum sweeti (Etheridge).

Fig. 1. F 1652. Lectotype. Geological Survey of Queensland Collection. Regan's, Reid Gap. Givetian. *a*, transverse, and *b*, vertical section.

Fig. 2. F 4963. Burdekin Downs, hill behind fowlyard. Givetian. *a*, transverse, and *b*, vertical section.

Fig. 3. F 4966. Burdekin Downs, hill behind fowlyard. Givetian. Transverse section.

Fig. 4. F 5015. Burdekin Downs, anabranch of Burdekin R. near Big Rocks. Givetian. *a*, transverse and *b*, vertical section.

Fig. 5. F 5012. Burdekin Downs, anabranch of Burdekin R. near Big Rocks. Givetian. *a*, transverse and *b*, vertical section.

Dohmophyllum clarkei sp. nov.

Fig. 6. F 4531. Holotype. Base of Fanning R. limestone, Fanning R. about 2 miles upstream from Fanning R. homestead. Givetian. *a*, transverse and *b*, vertical section.

Fig. 7. F 4451. Base of Fanning R. limestone, Fanning R. about 2 miles upstream from Fanning R. homestead. Givetian. Transverse section, young stage.

Fig. 8. F 4924. Burdekin Downs, fence running North from East end of night paddock. Givetian. *a*, transverse and *b*, vertical section.

Fig. 9. F. 4471 Limestone on road on left bank of Fanning R. about 1½ miles above Fanning R. homestead. Givetian. Transverse section.

Fig. 10. F 5166. Burdekin Downs, limestone dam. Givetian. Vertical section.

Fig. 11. F 5315. Reid Gap, portion 81v, parish of Wyoming, lower part of limestone. Givetian. Transverse section, young stage.

Lyrielasma curvatum sp. nov.

Fig. 12. F 4423. Holotype. Base of Fanning R. limestone, Fanning R. about 2 miles upstream from Fanning R. homestead. Givetian. *a*, transverse and *b*, vertical section.

Fig. 13. F 4502. Base of Fanning R. limestone, Fanning R. about 2 miles upstream from Fanning R. homestead. Givetian. *a*, transverse and *b*, vertical section.

Fig. 14. F 4453. Base of Fanning R. limestone, Fanning R. about 2 miles upstream from Fanning R. homestead. Givetian. Transverse section.

Plate VI.

Except where otherwise stated, the specimens are all in the University of Queensland Collection.

Figs. 1-4 and 10-13 × 1.8 diameters.

Figs. 5-9 natural size.

Lyrielasma? lophophylloides sp. nov.

Fig. 1. F 5129. Holotype. Burdekin Downs, limestone dam. Givetian. Transverse section.

Fig. 2. F 5127. Burdekin Downs, limestone dam. Givetian. *a*, transverse and *b*, vertical section.

Yabeia salmoni sp. nov.

Fig. 3. F 5025. Holotype. Burdekin Downs, anabranch of Burdekin R. near Big Rocks. Givetian. Transverse section. A section of *Disphyllum gregorii* is also seen.

Fig. 4. F 5022. Burdekin Downs, anabranch of Burdekin R. near Big Rocks. Givetian. Vertical section.

Calceola sandalina sandalina (*Linnaeus*).

Fig. 5. F 5174. Burdekin Downs, limestone dam. Givetian. Weathered surfaces.

Fig. 6. F 5175. Burdekin Downs, limestone dam. Givetian. Polished vertical section, showing operculum at top. The apical part is damaged by weathering.

Calceola sandalina alta Richter.

Fig. 7. F 5173. Burdekin Downs, limestone dam. Givetian. Flat side, slightly weathered.

Fig. 8. F 4465. Fanning R. station, limestone on road on left bank of Fanning R., about 1½ miles upstream from homestead. Flat side, weathered.

Fig. 9. F 4466. Fanning R. station, limestone on road on left bank of Fanning R., about 1½ miles upstream from homestead. Polished vertical section.

"Cystiphyllum" australe Etheridge.

Fig. 10. F 1652. Geological Survey of Queensland Collection. Lectotype. Regan's, Reid Gap. Givetian. *a*, transverse and *b*, vertical section.

Fig. 11. F 4900. Burdekin Downs, fence running North from East end of night paddock. Givetian. Transverse section.

Fig. 12. F 4901. Burdekin Downs, fence running North from East end of night paddock. Givetian. Transverse section.

Fig. 13. F 5088. Burdekin Downs, limestone dam. Givetian. *a*, transverse and *b*, vertical section.

Plate VII.

Except where otherwise stated, the specimens are all in the University of Queensland Collection.

All figures × 1.8 diameters.

"Cystiphyllum" cf. *pseudoseptatum* Schulz.

Fig. 1. F 4537. Fanning R., dome in Fanning R. by cow paddock tank. Givetian. *a*, transverse and *b*, vertical section.

Mesophyllum collare sp. nov.

Fig. 2. F 4392. Bed c, Fanning R, limestone, Fanning R. about 1½ miles above Fanning R. homestead. Givetian. *a*, transverse and *b*, vertical section, the latter placed sideways owing to exigencies of space.

Mesophyllum (*Dialithophyllum*) *fultum* sp. nov.

Fig. 3. F 4535. Holotype. Dome in Fanning R. by cow paddock tank, Fanning R. station. Givetian. *a*, transverse and *b*, vertical section.

Fig. 4. F 4536. Dome in Fanning R. by cow paddock tank, Fanning R. station. Givetian. Transverse section.

Plate VIII.

Except where otherwise stated, the specimens are all in the University of Queensland Collection.

All figures × 1.8 diameters.

Disphyllum gregorii (Etheridge).

Fig. 1. F D34, Geological Survey of Queensland Collection. Paratype. Regan's, Reid Gap. Givetian. Transverse section.

Fig. 2. F 4437. Base of Fanning R. limestone, Fanning R. about 2 miles above Fanning R. homestead. Givetian. *a*, transverse and *b*, vertical section.

Fig. 3. F 4448. Base of Fanning R. limestone, Fanning R. about 2 miles above Fanning R. homestead. Givetian. Vertical section.

Fig. 4. F 5021. Burdekin Downs, anabranch of Burdekin R. near Big Rocks. Givetian. *a*, transverse and *b*, vertical section.

Disphyllum (or *Macgeea*) *trochoides* sp. nov.

Fig. 5. F 4557. Holotype. Fanning R. station, windmill 3 miles ESE of homestead. Givetian. Transverse section.

Fig. 6. F 4560. Fanning R. station, windmill 3 miles ESE of homestead. Givetian. *a*, vertical section; *b*, transverse section of young stage.

Fig. 7. F 5246. Reid Gap, portion 370 parish of Magenta, lower bed. Givetian. *a*, transverse and *b*, vertical section.

Fig. 8. F 5248. Reid Gap, portion 370 parish of Magenta, lower bed. Givetian. Transverse section.

Fig. 9. F 4911. Burdekin Downs, fence running North from East end of night paddock. Givetian. *a*, transverse and *b*, vertical section.

Fig. 10. F 4970. Burdekin Downs, hill behind fowlyard. Givetian. *a*, transverse and *b*, vertical section.

Disphyllum (or *Macgeea*) *excavatum* sp. nov.

Fig. 11. F D42, Geological Survey of Queensland Collection. Holotype. Burdekin Downs. Givetian. *a*, transverse and *b*, vertical section; *c*, transverse section of young stage. *a* shows the effect of crushing.

Fig. 12. F 13 (in red), Geological Survey of Queensland Collection. Burdekin Downs. Givetian. *a*, transverse and *b*, vertical section.

Fig. 13. F 5322. Reid Gap, portion 370 parish of Magenta, 30 ft. above lower bed. Givetian. Transverse section.

Endophyllum abditum var. *columna* var. nov.

Fig. 14. F 4274. Top of Fanning R. limestone, road on left bank of Fanning R., 1½ miles above Fanning R. homestead. Givetian. Transverse section.

Plate IX.

Except where otherwise noted, the specimens are all in the University of Queensland Collection.

All figures × 1.8 diameters.

Endophyllum abditum var. *columna* var. nov.

Fig. 1. F 4275. Holotype. Top of Fanning R. limestone, road on left bank of Fanning R. 1½ miles above Fanning R. homestead. Givetian. *a*, transverse and *b*, vertical section.

Favistella rhenana (Frech).

Fig. 2. F 4409. Fanning R. limestone, on Fanning R. 1½-2 miles above homestead. Givetian. *a*, transverse and *b*, vertical section.

Fig. 3. F BD. Geological Survey of Queensland Collection. Burdekin Downs. Givetian. *a*, transverse and *b*, vertical section.

Fasciphyllum ryani sp. nov.

Fig. 4. F 5018. Holotype. Burdekin Downs, anabranch of Burdekin R. near Big Rocks. Givetian.

Fig. 5. F 5364. Calcium (probably Ryans Quarry). Givetian. *a*, transverse and *b*, vertical section.

Spongophyllum immersum sp. nov.

Fig. 6. F Z82. Geological Survey of Queensland Collection. Holotype. Burdekin Downs, Arthur's Ck. Givetian. *a*, transverse and *b*, vertical section.

Grypophyllum sp.

Fig. 7. F 4501. Base of Fanning R. limestone, Fanning R. 2 miles above Fanning R. homestead. Givetian. *a*, transverse and *b*, vertical section.

Plate X.

Except where otherwise noted, the specimens are all in the University of Queensland Collection.

All figures × 1.8 diameters.

Grypophyllum compactum sp. nov.

Fig. 1. F 5317. Holotype. Reid Gap, portion 81v parish of Wyoming, lower part of limestone. Givetian. *a*, *b*, transverse sections, *b*, shows method of increase.

Fig. 2. F 5314. Reid Gap, portion 81v parish of Wyoming, lower part of limestone. Givetian. Vertical section.

Fig. 3. F 5316. Reid Gap, portion 81v parish of Wyoming, lower part of limestone. Givetian. Transverse section.

Fig. 4. F 5307. Reid Gap, portion 81v parish of Wyoming, lower part of limestone. Givetian. Transverse section.

Stringophyllum quasinormale sp. nov.

Fig. 5. F 4528. Holotype. Base of Fanning R. limestone. Fanning R. about 2 miles above Fanning R. homestead. Givetian. *a*, transverse and *b*, vertical section.

Fig. 6. F 5139. Burdekin Downs, limestone dam. Givetian. Transverse section.

Fig. 7. F 5247. Reid Gap, portion 370 parish of Magenta, lower bed. Givetian. *a*, transverse and *b*, vertical section.

Fig. 8. F 5081. Burdekin Downs, limestone dam. Givetian. Transverse section.

Fig. 9. F 5083. Burdekin Downs, limestone dam. Givetian. Vertical section.

Stringophyllum quasinormale, var ?.

Fig. 10. F 5087. Burdekin Downs, limestone dam. Givetian. *a*, transverse and *b*, vertical section.

Stringophyllum quasinormale var. *ana* var. nov.

Fig. 11. F 5011. Holotype. Burdekin Downs, anabranch of Burdekin R. near Big Rocks. Givetian. *a*, transverse and *b*, vertical section.

Fig. 12. F 5027. Burdekin Downs, anabranch of Burdekin R. near Big Rocks. Givetian. *a*, transverse and *b*, vertical section.

Fig. 13. F 5007. Burdekin Downs, anabranch of Burdekin R. near Big Rocks. Givetian. *a*, transverse and *b*, vertical section.

Fig. 14. F 5006. Burdekin Downs, anabranch of Burdekin R. near Big Rocks. Givetian. *a*, transverse and *b*, vertical section.

Plate XI.

Except where otherwise noted, all specimens are in the University of Queensland Collection.

All figures × 1.8 diameters.

Stringophyllum bipartitum sp. nov.

Fig. 1. F 4398. Holotype. Bed c, Fanning R. limestone, Fanning R. about 1½ miles above Fanning R. homestead. Givetian. Transverse section.

Fig. 2. F 4396. Bed c, Fanning R. limestone, Fanning R. about 1½ miles above Fanning R. homestead. Givetian. *a*, transverse section, *b*, vertical section along fossula and *c*, vertical section across fossula.

Fig. 3. F 5366. Ryan's Qy., Calcium, Reid Gap. Givetian. Transverse section.

Stringophyllum irregulare sp. nov.

Fig. 4. F 4904. Holotype. Burdekin Downs, fence running North from East end of night paddock. Givetian. Transverse section.

Fig. 5. F 4895. Burdekin Downs, fence running N from E end of night paddock. Givetian. *a*, transverse and *b*, vertical section.

Fig. 6. F 4893. Burdekin Downs, fence running N from E end of night paddock. Givetian. Vertical section.

Fig. 7. F 4897. Burdekin Downs, fence running N from E end of night paddock. Givetian. Transverse section.

Fig. 8. F 4906. Burdekin Downs, fence running N from E end of night paddock. Givetian. Transverse section.

Stringophyllum isactis (Frech).

Fig. 9. F 4365. Top of Fanning R. limestone, road on left bank of Fanning R., about 1½ miles above Fanning R. homestead. Givetian. *a*, transverse and *b*, vertical section.

Fig. 10. F 4366. Top of Fanning R. limestone, road on left bank of Fanning R., about 1½ miles above Fanning R. homestead. Givetian. *a*, transverse and *b*, vertical seition.

Fig. 11. F 4367. Top of Fanning R. limestone, road on left bank of Fanning R., about 1½ miles above Fanning R. homestead. Givetian. Transverse section.